1998/1999 ANNUAL REPORT

CIPEC

dian industry program for
energy conservation

OEE

Office of Energy Efficiency
Office de l'efficacité énergétique

Leading Canadians to Energy Efficiency
at Home, at Work and on the Road

PRINTED IN CANADA
IMPRIMÉ AU CANADA

Printed on recycled paper

Copies of this publication may be obtained free of charge from:

Brent Wakeford
Project Manager
Office of Energy Efficiency
Natural Resources Canada
Tel: (613) 947-7782
Fax: (613) 947-2399
Email: bwakefor@nrcangc.ca

0-662-29045-3
M92-143/1999-1E*

128

OUR mission

To promote effective voluntary action that reduces industrial energy use per unit of production, thereby improving economic performance while participating in meeting Canada's climate change objectives.

CIPEC

Canadian Industry Program for Energy Conservation

1998/1999 CIPEC ANNUAL REPORT

Success Stories

Sector Reports

CHAIRMAN'S letter

The Honourable Ralph Goodale
Minister of Natural Resources
Ottawa, Ontario
K1A 0A6

Dear Minister:

In this, our 25th year of voluntary cooperation between government and the private sector, I am pleased to present CIPEC's 1998/1999 Annual Report.

In its quarter-century life, CIPEC has become a shining example of the success that can be achieved through volunteerism. The 1998/1999 year is no exception. Acting on their commitment to the efficient use of energy, hundreds of companies in Canada's mining and manufacturing industries have taken steps to help Canada meet its international climate change commitments. Sector by sector, they have employed their own capital and their own resources to make energy efficiency improvements that benefit all Canadians. They have acted free from the demands of regulation because it makes sound economic sense, and because it is the right thing to do.

I am most encouraged to report that CIPEC's momentum is growing. At the end of the reporting year, CIPEC had expanded to 23 task forces made up of 34 trade and business associations. These associations represent more than 3 000 companies and approximately 90 percent of secondary industrial energy demand in Canada. Among these companies, we see growing individual interest in CIPEC programs, as organizations increasingly look toward our information resources to find new blueprints for action.

Most important, CIPEC participants are delivering results. Through voluntary action, companies under the CIPEC umbrella helped achieve an average annual energy intensity improvement of 1.26 percent for the years 1990 to 1998. Although Canada experienced an extended period of economic growth through the 90s, a trend generally accompanied by increased energy consumption, energy-use-related carbon dioxide emissions increased by a meagre 0.4 percent from 1990 to 1998. This indicates virtual emissions stabilization.

This is my final report to you as Chair of the CIPEC Executive Board. I am pleased that my term is complete at a time when CIPEC's voluntary approach is yielding such exciting results. This success is in no small part due to the continuing support, imagination, dedication and hard work of your staff at the Office of Energy Efficiency. I'd like to express my appreciation for their exceptional contributions and for your commitment to the CIPEC partnership. With your continuing support, the achievements will be the prologue to even better results in the years ahead.

Peter Cooke
Executive Vice-President – Cement, Lafarge Corporation and
Chair, CIPEC Executive Board

25 YEARS OF voluntary success

The year 2000 marks 25 years for the Canadian Industry Program for Energy Conservation (CIPEC). This remarkable milestone is a tribute to the stamina and commitment of hundreds of people in both the public and private sectors across Canada. Their efforts over two and a half decades have enabled CIPEC not only to survive, but also to evolve and grow into the country's principal example of voluntary cooperation between business and government.

CIPEC has shown, and continues to demonstrate, that volunteerism on a major national scale can work. With initiatives coming from nearly every industrial sector in Canada, and with support from government, manufacturing and mining companies are helping Canada to improve its energy efficiency, cut its greenhouse gas (GHG) emissions, and meet its international climate change commitments. In fact, the cooperative philosophy CIPEC represents fits perfectly with Canada's approach as it strives to meet the climate change commitments made at Kyoto, Japan, in 1997.

This report documents the results achieved by mining and manufacturing companies in the 1998/1999 reporting year. It highlights the companies that have backed their commitment to energy efficiency with action, and presents the statistics behind their combined successes.

CIPEC ON THE THRESHOLD

CIPEC is the world's oldest voluntary industrial energy efficiency program and the only industry-wide organization to establish and publish energy-intensity improvement targets. Despite its age, the organization is in a period of strong growth, as manufacturing and mining companies and their trade associations increasingly realize the connection between energy efficiency and operating efficiency. To these organizations, it is clear that what is good for the environment can also be good for business.

Participation in CIPEC is at an all-time high. There are now 23 task forces, each representing an industrial sector (up from 21 in the 1997/1998 report). Within these sectors, 34 trade and business associations are now participating, representing more than 90 percent of the companies in their sectors. At the

HOW CIPEC WORKS

CIPEC is the umbrella organization overseeing an exceptional partnership between government and private industry. CIPEC is composed of sectoral task forces, each of which represents companies engaged in similar industrial activities that participate through their trade associations. Overall direction is provided by an Executive Board made up of private sector leaders committed to industrial energy efficiency. The Task Force Council, with representatives from each CIPEC sector, provides a common forum for sectors to share ideas and recommend ways to address common needs.

CIPEC's extraordinary public-private relationship is successful because it is built not on government regulation, but on trust. In the CIPEC partnership, voluntary change emerges from the dynamics of open and honest communication – a full articulation of issues from all viewpoints that builds consensus and leads to joint action.

CIPEC continues to be the focal point for the manufacturing and mining response to Canada's National Action Program on Climate Change. Our role is to promote the evolution of energy efficiency and to identify and reward those who lead the way.

We carry out this mandate in part through a strong communication and awareness program grounded in our twice-monthly *Heads Up CIPEC* newsletter and regular features in selected trade magazines. *Heads Up CIPEC*, which was first published three years ago with a circulation of 55, now has 1 700 subscribers and boasts a readership of more than 3 000. These programs celebrate energy efficiency innovations and the industry leaders behind them and provide ideas to improve business and economic benefits through reductions in energy use.

CIPEC also raises awareness of the goals and benefits of improved energy use through a number of other efforts. Regular sector task force meetings are held in which non-competitive information is exchanged. The Task Force Council and individual sectors are constantly at work to bring additional participants to the CIPEC fold and to develop communication programs to bolster public and industry awareness of the role and achievements of CIPEC industries.

CIPEC volunteers include successful business leaders and others recognized on the national stage. The quality and profile of these leaders, and their strong belief in voluntary change without government regulation, give CIPEC a strong edge in attracting new industry participants and in continuing the successful partnership between industry and government.

energy conferences sponsored and supported by these sectors, attendance is growing rapidly. ***Increasing numbers of companies are making substantial capital investments and achieving major energy efficiency gains. All indications are that the interest in and commitment to energy efficiency have never been greater.***

AN ENCOURAGING TRACK RECORD

The voluntary efforts of trade associations participating in CIPEC and the companies they represent are having a positive effect on Canada's energy intensity. ***CIPEC's overall annual average improvement in energy intensity from the 1990 base year through 1998 is 1.26 percent, exceeding our target of 1 percent per year. This contrasts with an economic growth rate between 1990 and 1998 of 19.3 percent, an annual average growth rate of 2.3 percent.***

Despite the increased industrial activity brought by strong economic growth, energy-related CO_2 emissions have stabilized. From 1990 through 1998, CO_2 emissions rose by only 0.4 percent in the manufacturing and metal and non-metal mining industries. ***In total, since CIPEC was launched in 1975, the companies within its sectors have reduced their average annual energy intensity by 36 percent.***

These results reflect CIPEC's success in raising awareness of energy efficiency issues and the subsequent willingness of companies to adopt practices and make investments that boost profitability by improving energy use.

AWARD-WINNING PERFORMANCE

A number of companies under the CIPEC umbrella achieved energy efficiency excellence in the 1998/1999 year. Eleven companies are highlighted in the Success Stories section of this report. Five sector companies are among the first recipients of Natural Resources Canada's (NRCan's) Office of Energy Efficiency National Energy Efficiency Awards. Initiated in 1999 as part of NRCan's efforts to encourage companies to improve their energy performance, the annual awards recognize companies in all sectors of the economy that exhibit excellence in their energy efficiency efforts.

Companies that received the awards are:

Potash Corporation of Saskatchewan Inc. – for replacing a cooling tower with a shell and tube exchanger to enable total heat recovery from crystallizer vapours, thereby reducing energy use by 30 percent and saving 134 TJ of energy annually.

Labatt Breweries of Canada – for conducting an energy reduction initiative covering all energy

uses at its breweries that led to energy reductions of 24 percent since 1994.

Dofasco Inc. and Stelco Inc. – for their major contribution to the development of cost-effective ultralight steel auto body technology, which reduces car frame weight by 35 percent while maintaining structural strength, demonstrating that process and product improvements can be good for both business and the environment.

DML Control Inc. – for engineering a computerized Hench modular refrigeration control system at Maple Lodge Farms Ltd. that saved from 20 percent to 40 percent in annual compressor operating costs.

NRCan received more than 150 submissions for the 1999 National Energy Efficiency Awards, an outstanding response for a new program. Such vigorous and immediate acceptance indicates strong grassroots support for Canada's energy efficiency efforts and accentuates the importance of CIPEC as a resource for companies seeking ways to advance their energy-management programs.

THE EVOLUTION OF CIPEC DATA

Accurate measurement and meaningful data are fundamental to measuring energy efficiency improvements. The data used in this report is collected by Statistics Canada and interpreted by the Canadian Industrial Energy End-use Data and Analysis Centre (CIEEDAC) at Simon Fraser University in British Columbia. From the Statistics Canada data, CIEEDAC produces energy-intensity indicators for each sector based on production and gross domestic product. CIPEC continues to collaborate with Statistics Canada and CIEEDAC in ongoing efforts to resolve data issues.

The cooperative CIEEDAC system is internationally recognized for its methodologies, data integrity and cooperation with CIPEC. Primary funding for CIEEDAC comes from CIPEC and NRCan with additional contributions from industry associations and the Province of Quebec.

SUCCESS BUILT SECTOR BY SECTOR

CIPEC is effective because it provides a common yet flexible framework for industrial energy efficiency. Sectors, and the associations and organizations of which they are made, work within this framework to take individual and joint actions to meet sectoral energy efficiency goals. Ultimately, it is the willingness of individual enterprises to change their practices and invest in new methods and technologies that determines CIPEC's success.

CIPEC's goal is to encourage companies to take action and to support them with the information and motivation they need to take the steps necessary for improved energy efficiency. Many sectoral task forces have stepped forward to create and implement effective programs focused on targeting, tracking and reporting. Some sectors hold annual energy conferences and many are producing best practice guides, offering education and training, and supporting employee awareness programs. These efforts have helped numerous companies introduce effective energy-management programs and take steps toward greater energy efficiency.

CIPEC CAN DO MORE

CIPEC has survived and grown over 25 years because of a willingness to adapt. Our challenge going forward is to evolve our programs in step with the changing needs of firms as they strive for energy efficiency improvements.

For example, CIPEC's unique government and private sector partnership is identifying new technologies that advance energy efficiency and developing and publicizing innovative financing methods to underwrite energy-based capital investments. Sectors are collaborating to find ways to raise the priority of energy efficiency within Canada's industrial organizations. Sectoral associations are working with CIPEC's government partners to develop meaningful benchmarking tools that can establish performance and measure progress.

All of these efforts, and many more, are needed if Canada is to progress toward its climate change commitments.

GOING FORWARD

While CIPEC sectors and companies have made major advances in energy efficiency, there is much work yet to be done. Existing programs must be enhanced and expanded. New programs must be conceived and launched, and participation must be increased. ***Our goal is to encourage more active companies within the program and more active programs within the companies.***

Our current focus is to establish new targets and a new business plan for the next three years. Existing energy-intensity targets expire in 2000, and CIPEC sectors have been developing and finalizing a new plan to extend to 2003. This plan will provide a focus for action as we progress into the new millennium.

Although CIPEC is 25 years old, there is an unprecedented vitality in the organization. This energy, enthusiasm and underlying strength reflects the importance of our organization to Canada's energy future and the country's ability to meet its international commitments. While there is much to celebrate about CIPEC's past, the indications are that the best is yet to come.

INNOVATION AND CANADA'S CLIMATE CHANGE VOLUNTARY CHALLENGE AND REGISTRY INC.

The Industrial Energy Innovators initiative helps companies put sector-level commitments into action at the individual corporate level. As of April 1, 2000, 254 companies, representing more than 75 percent of industrial energy use, had signed on as Industrial Energy Innovators. The majority of these companies are participants in Canada's Climate Change Voluntary Challenge and Registry Inc. (VCR Inc.).

CIPEC has broadened and deepened individual participation of Industrial Energy Innovators in the VCR Inc. through a number of programs. These include efforts designed to increase awareness of the economic benefits of improved energy use and the development of tools to remove barriers hindering energy-management improvement projects within companies. CIPEC believes that to maximize its impact on energy efficiency, it should lend support to as many parallel efforts as possible.

Judith Arbour
Director, Operations
Canadian Foundry Association
1 Nicholas Street, Suite 1500
Ottawa, Ontario K1N 7B7
Tel: (613) 789-4894
Fax: (613) 789-5957
e-mail: metassn@istar.ca

Eric Barry
President
Canadian Textiles Institute
66 Slater Street, Suite 1720
Ottawa, Ontario K1P 5H1
Tel: (613) 232-7195
Fax: (613) 232-8722
e-mail: ebarry@textiles.ca

Jack Belletrutti
Vice-President
Canadian Petroleum Products Institute
275 Slater Street, Suite 1000
Ottawa, Ontario K1P 5H9
Tel: (613) 232-3709 Ext. 209
Fax: (613) 236-4280
e-mail: jackbelletrutti@cppi.ca

Dick Bowman
General Manager
Ingersoll Lime Ltd.
P.O. Box 98
Ingersoll, Ontario N5C 3K1
Tel: (519) 485-2730 Ext. 3200
Fax: (519) 485-6039
e-mail: dick.bowman@globalstone.com

Don Campbell
President
Rubber Association of Canada
89 Queensway West, Suite 308
Mississauga, Ontario L5B 2V2
Tel: (905) 270-8322
Fax: (905) 270-2640
Alternate Address:
47 Cremona Crescent
Nepean, Ontario K2G 0Z9
Tel: (613) 727-8664
Fax: (613) 228-8572
e-mail: doncamp@inforamp.net

C. Bruce Caswell
Senior Project Manager
Environment, Health and Safety
Canadian Chemical Producers' Association
350 Sparks Street, Suite 805
Ottawa, Ontario K1R 7S8
Tel: (613) 237-6215 Ext. 241
Fax: (613) 237-4061
e-mail: bcaswell@ccpa.ca

Peter Chantraine
Manager, Energy and Environment
DuPont Canada Inc.
455 Front Road
P.O. Box 2100
Kingston, Ontario K7L 4Z6
Tel: (613) 548-5025
Fax: (613) 548-5356
e-mail: peter.chantraine@can.dupont.com

Bob Clapp
Vice-President, Ontario Division
Canadian Petroleum Products Institute
235 Yorkland Boulevard, Suite 510
North York, Ontario M2J 4YB
Tel: (416) 492-5677 Ext. 33
Fax: (416) 492-2514
e-mail: bobclapp@cppi.ca

Alicje Cornelissen
Manager, Building Sciences
Canadian Portland Cement Association
60 Queen Street, Suite 1500
Ottawa, Ontario K1P 5Y7
Tel: (613) 236-9471
Fax: (613) 563-4498
e-mail: acornelissen@cpca.ca

André Desroches
Vice-président, Fabrication est du Canada
EMCO limitée
9510, rue St-Patrick
LaSalle, Québec H8R 1R9
Tel: (514) 364-7528
Fax: (514) 364-4487
e-mail: ades@emcoltd.com

Brad Erhardt
Manager of Waste and Environment
J.M. Schneider, Inc.
321 Courtland Avenue East
Kitchener, Ontario N2G 3X8
Tel: (519) 741-5000 Ext. 7883
Fax: (519) 749-7409

David Finlayson
Manager, Technical Affairs
Canadian Fertilizer Institute
222 Queen Street, Suite 1504
Ottawa, Ontario K1P 5V9
Tel: (613) 230-2600
Fax: (613) 230-5142
e-mail: cdnfert@ibm.net

Bob Flemington
President
VCR Inc.
170 Laurier Avenue, West
Ottawa, Ontario K1P 5V5
Tel: (613) 565-5151
Fax: (613) 565-5743
e-mail: info@vcr-mvr.ca

Lauri Gregg
Director, Energy and Technology Services
Falconbridge Limited
95 Wellington Street West, Suite 1200
Toronto, Ontario M5J 2V4
Tel: (416) 956-5752
Fax: (416) 956-5757
e-mail: lgregg@falconbridge.com

Paul Hansen
Manager, Environmental Affairs
CIMS 232-02-02
DaimlerChrysler Corporation
2545 Chrysler Centre
Windsor, Ontario N9A 4H6
Tel: (519) 973-2864
Fax: (519) 973-2613
e-mail: plh2@daimlerchrysler.com

Derek Holden
c/o Owens-Corning Canada Inc.
71 Heatherwood Crescent
Unionville, Ontario L3R 8V6
Tel: (905) 479-7279
Fax: (905) 479-6760
e-mail: djholden@netcom.ca

Steve Horvath
President and Chief Executive Officer
Cimatec Environmental Engineering Inc.
931 Progress Avenue
Scarborough, Ontario M1G 3V5
Tel: (416) 289-8882
Fax: (416) 289-4185

Vivian Khayat
Director, Communications and Finance
National Dairy Council of Canada
221 Laurier Avenue, East
Ottawa, Ontario K1N 6P1
Tel: (613) 238-4115
Fax: (613) 238-6247
e-mail: vkhayat@ndc.ca

Walter Kraus
Director, Environmental Affairs
George Weston Ltd./Loblaw Companies Ltd.
22 St. Clair Avenue East, Suite 1901
Toronto, Ontario M4T 2S8
Tel: (416) 922-1383 Ext. 5414
Fax: (416) 922-4395 or (416) 922-8713
e-mail: wflwhk@weston.ca

Sue Olynyk
Senior Energy Specialist
Dofasco Inc.
P.O. Box 2460
Hamilton, Ontario L8N 3J5
Tel: (905) 548-7200 Ext. 6107
Fax: (905) 548-4267
e-mail: solynyk@dhc.dofasco.ca

Ches Parsons
Steam Plant Superintendent
Corner Brook Pulp and Paper Limited
P.O. Box 2001
Corner Brook, Newfoundland A2H 6J4
Tel: (709) 637-3474
Fax: (709) 637-3539
e-mail: ches@thezone.net

Dan Potts
Council of Forest Industries
1200 – 555 Burrard Street
Vancouver, British Columbia V7X 1S7
Tel: (604) 891-1268
Fax: (604) 687-4930
e-mail: potts@cofiho.cofi.org

Peter Torbet
Madawaska Hardwood Flooring
2 Innovation Drive
P.O. Box 490
Renfrew, Ontario K7V 4B1
Tel: (613) 432-7521
Fax: (613) 432-9231

Anthony Van Heyningen
Manager, Environmental Affairs
Canadian Soft Drink Association
55 York Street, Suite 330
Toronto, Ontario M5J 1R7
Tel: (416) 362-2424
Fax: (416) 362-3229
e-mail: 102254.1603@compuserve.com

Christian Van Houtte
President
Aluminum Industry Association
1010 Sherbrooke West, Room 1600
Montréal, Quebec H3A 2R7
Tel: (514) 288-4842
Fax: (514) 288-0944
e-mail: associa@aluminium.qc.ca

Lucie Veilleux
Manager, Environment and Energy
Canadian Pulp and Paper Association
Sun Life Building
1155 Metcalfe Street, 19th Floor
Montréal, Quebec H3B 4T6
Tel: (514) 866-6621 Ext. 220
Fax: (514) 866-3035
e-mail: lveilleux@cppa.ca

Kees Versfeld
Energy Management Leader
Syncrude Canada Ltd.
P.O. Box 4009, Mail Drop #2030
Fort McMurray, Alberta T9H 3L1
Tel: (780) 790-8605
Fax: (780) 790-4875
e-mail: versfeld.kees@syncrude.com

David White
Manager, Port Hope Operations
ESCO Limited
Hope Street South
P.O. Box 270
Port Hope, Ontario L1A 3W4
Tel: (905) 885-3145
Fax: (905) 885-9641
e-mail: dwwhite@escocorp.com

Jim Wilson
Plant Manager
Owens-Corning Canada Inc.
831 Hayter Road
P.O. Box 595
Edmonton, Alberta T5J 2L1
Tel: (780) 472-5882
Fax: (780) 472-6601
e-mail: jim.wilson@owenscorning.com

Peter Cooke
Executive Vice-President – Cement
Lafarge Corporation
11130 Sunrise Valley Drive, Suite 300
Reston, Virginia, USA 20191
Tel: (703) 264-3660
Fax: (703) 264-1636
e-mail: peter_cooke@lafargecorp.com

Peter Darbyshire
Vice-President and General Manager
Continental Lime Ltd.
3025 – 12th Street North East, Suite 190
Calgary, Alberta T2E 7J2
Tel: (403) 250-9100
Fax: (403) 291-1303

Robert J. Eamer
Senior Vice-President
Technology Development
Domtar Inc.
395 de Maisonneuve Blvd. West
Montréal, Quebec H3A 1L6
Tel: (514) 848-5421
Fax: (514) 848-6769
e-mail: robert_eamer@email.domtar.com

Timothy Eby
President
Wabi Iron and Steel Corporation
330 Broadway Avenue
P.O. Box 1510
New Liskeard, Ontario P0J 1P0
Tel: (705) 647-4383
Fax: (705) 647-6954

Daniel Gagnier
Vice-président
Affairs générale et environnementales,
santé et sécurité
Alcan Aluminium Limitée
1188 rue Sherbrooke ouest
Montréal, Québec H3A 3G2
Tel: (514) 848-8118
Fax: (514) 848-1494
e-mail: daniel.gagnier@alcan.com

Warren Holmes
Senior Vice-President
Canadian Operations
Falconbridge Limited
95 Wellington Street West, Suite 1200
Toronto, Ontario M6J 2V4
Tel: (416) 956-5793
Fax: (416) 956-5719

Boris Jackman
Executive Vice-President
Downstream Sector
Petro-Canada
2375 Rebbecca Street
Oakville, Ontario L6L 3N5
Tel: (905) 469-3700
Fax: (905) 469-3974

Paul Kelly
President and CEO
Slater Steels Inc.
Markborough Place
6711 Mississauga Road, Suite 202
Mississauga, Ontario L5N 2W3
Tel: (905) 567-1822
Fax: (905) 567-0946

Emmie Leung
Chief Executive Officer
International Paper Industries Limited
132 Riverside Drive North
North Vancouver, British Columbia V7H 1T9
Tel: (604) 929-7377 Ext. 210
Fax: (604) 929-3417

Brenda Macdonald
President
Coyle & Greer Awards Canada Ltd.
4819 Mossley Drive
Mossley, Ontario N0L 1V0
Tel: (519) 269-3000
Fax: (519) 269-3038

Geoffrey Moore
President
Fibrex Insulations Inc.
P.O. Box 2079
561 Scott Road
Sarnia, Ontario N7T 7L4
Tel: (519) 336-7770
Fax: (519) 336-1634

Ronald C. Morrison
Chairman of the Board
Kodak Canada Inc.
3500 Eglinton Avenue West
Toronto, Ontario M6M 1V3
Tel: (416) 766-8233
Fax: (416) 761-4399

Peter F. Rankine
President
Honeywell Limited
The Honeywell Centre
155 Gordon Baker Road
North York, Ontario M2H 3N7
Tel: (416) 502-4050
Fax: (416) 502-4059

John D. Redfern
Chairman of the Board
Lafarge Canada Inc.
606 Cathcart Street, 8th Floor
Montréal, Quebec H3B 1L7
Tel: (514) 861-1411
Fax: (514) 876-8900

Tayce Ann Wakefield
Vice-President, Corporate Affairs
General Motors of Canada Ltd.
1908 Colonel Sam Drive
Oshawa, Ontario L1H 8P7
Tel: (905) 644-5000
Fax: (905) 644-3830

INNOVATION in action

As the Canadian Industry Program for Energy Conservation (CIPEC) gears up to celebrate its 25th anniversary of volunteer cooperation between the federal government and Canada's manufacturing and mining industries, we invite you to read about the efforts of 11 CIPEC participants that have substantially reduced the energy intensity of their operations.

The approaches and successes exhibited by these forward-looking organizations are only a representative sample of the impressive energy efficiency improvement results being achieved across Canada through the voluntary efforts of Canadian industry. CIPEC participants, such as the companies featured here, demonstrate day in and day out that hundreds of companies taking individual action can have a substantial, positive impact on our environment and make a vital contribution to Canada's success in meeting its international commitments.

Equally important, investments and efforts designed to improve energy efficiency have also helped participating companies reduce costs and improve profitability – vital components of every successful enterprise's business strategy. Their achievements demonstrate that responsible environmental action can significantly improve the bottom line.

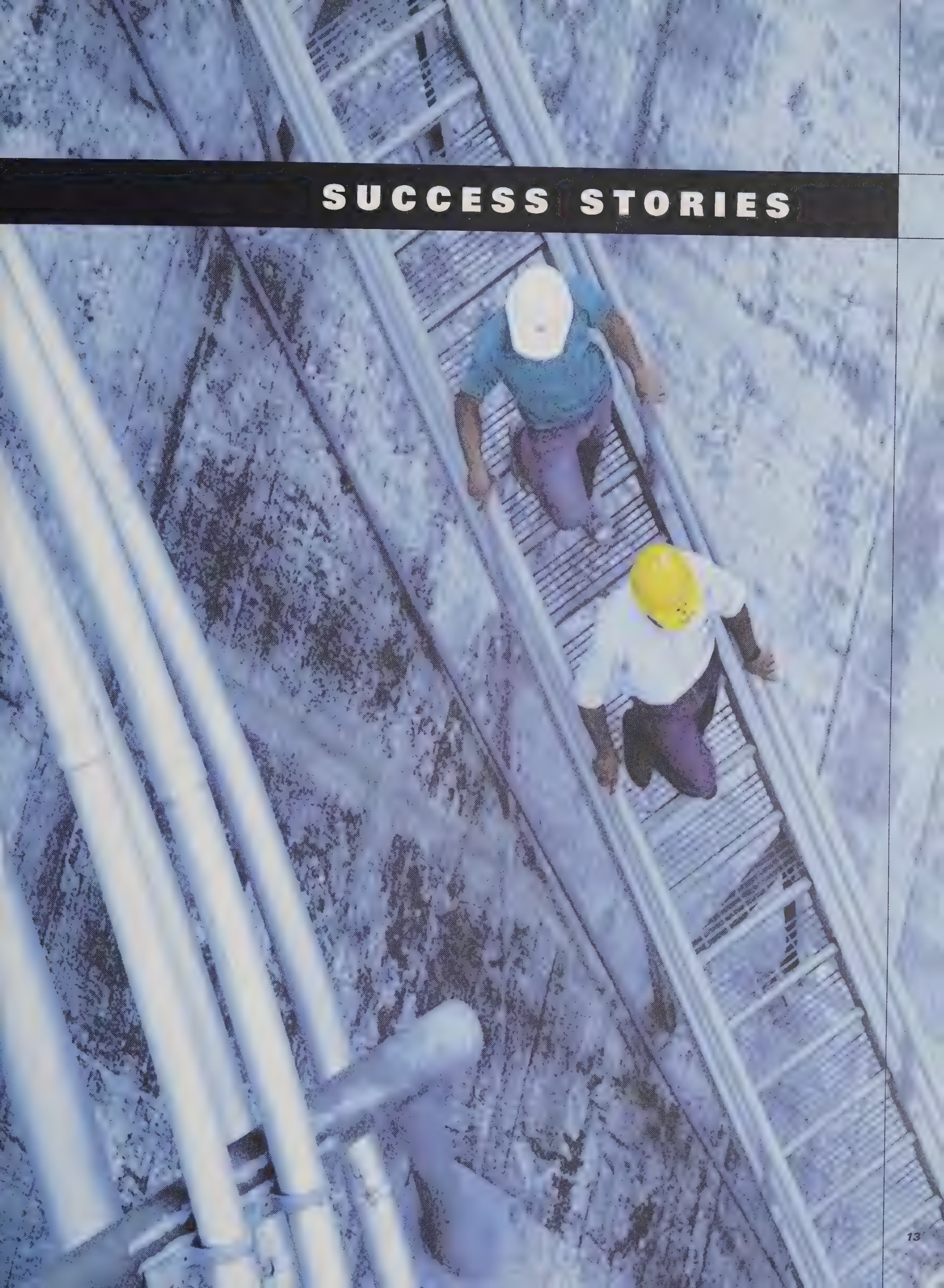
Since 1990, companies participating in CIPEC have made important voluntary contributions toward our nation's goals of decreasing energy intensity and reducing the production of greenhouse gases. Between 1990 and 1997, Canada's mining and manufacturing companies improved their average annual energy intensity by 0.9 percent. Since 1990, despite a strongly expanding economy, better use of energy has enabled these companies to limit related carbon dioxide emissions to a marginal increase of less than 0.5 percent. No other sector of the Canadian economy can lay claim to such results.

Providing a role model for government-business partnerships in Canada, CIPEC continues to be the focal point for the manufacturing and mining response to Canada's National Action Program on Climate Change. CIPEC is also building an international reputation and regularly fields inquiries from governments, business and industry around the world.

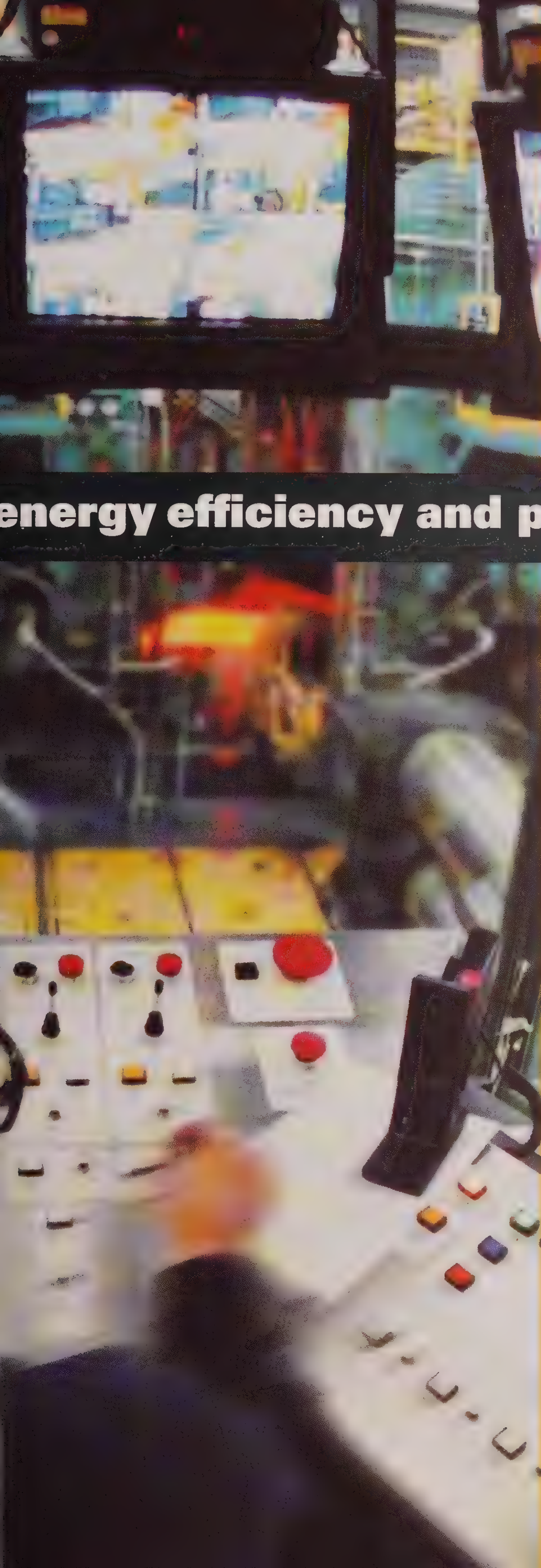
PHCooke

Peter Cooke
Executive Vice-President – Cement, Lafarge Corporation and
Chair, CIPEC Executive Board

SUCCESS STORIES



ALGOMA STEEL INC. | New complex nets major



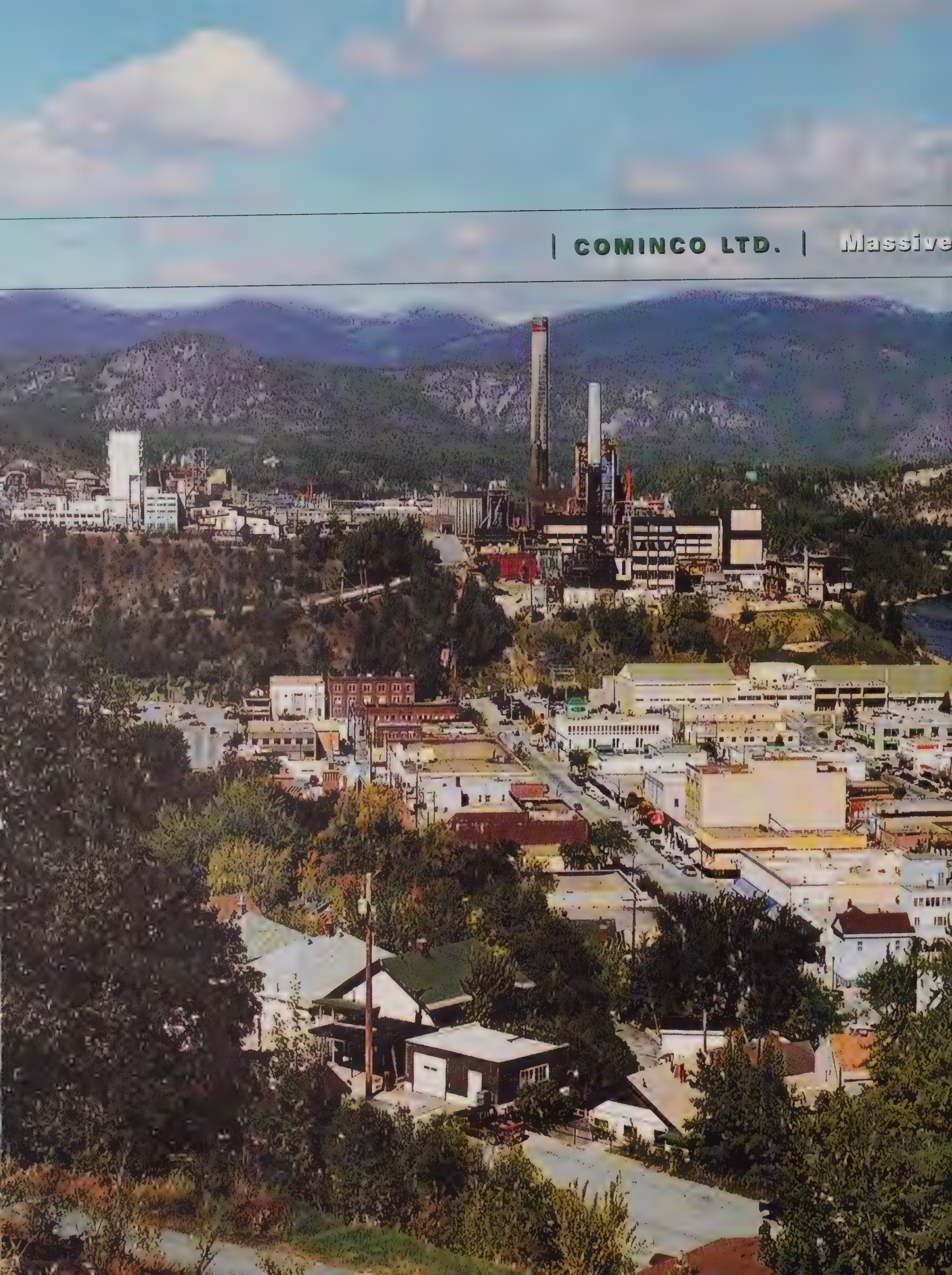
The new Direct Strip Production Complex at Algoma Steel Inc. has raised the industry's energy efficiency bar.

Conventional rolled steel production begins with the conversion of melted steel into thick, 200-mm to 300-mm slabs. The slabs are cooled and transported to rolling mills where they are reheated to high temperatures, then progressively rolled to the desired thickness. Heat loss is high and large quantities of energy are needed to complete the process.

energy efficiency and product quality gains

Algoma's direct strip production process begins by casting 230-tonne ladles of steel into 70-mm slabs—thinner material that is more easily rolled to finished dimensions. The newly formed slabs, which are still at nearly 1000°C, are further heated to 1200°C. In one pass through the roughing mill, they are descaled, edged and rolled to 35 mm. Measures built into the finishing mill to maintain exact temperatures enable final rolling and cooling at precisely controlled, uniform speeds. The process produces finished coil from liquid steel in less than 15 minutes, while ensuring consistent physical properties and precise gauge from one end of the roll to the other. Final product thickness is from 1 mm to 15 mm.

By closely linking the casting and rolling processes, Algoma conserves energy while enhancing production efficiency. From virgin materials to finished coils, Algoma Steel's new production complex is built around energy efficiency and now produces some of North America's highest quality, lowest cost steel coil.



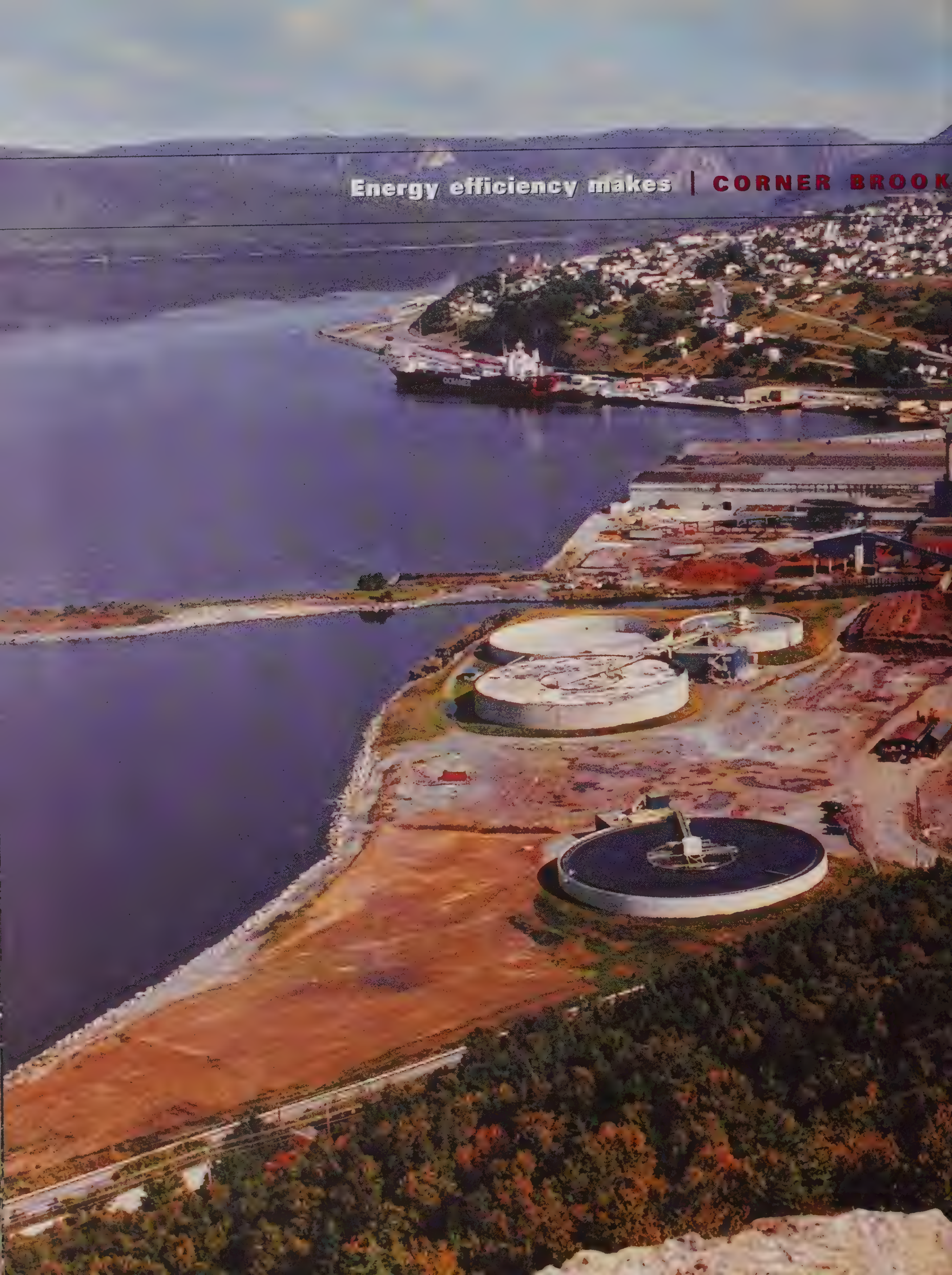
An investment of several hundred million dollars over the past two decades has enabled Cominco Ltd. to modernize its mining technology and significantly reduce carbon fuel intensity at its facility in Trail, B.C.

[I]nvestment brings major emission reductions

State-of-the-art technology, including a recently installed $160-million Kivcet flash smelting process, has enabled Cominco to improve its energy efficiency and cut its greenhouse gas emissions. The new lead smelter has reduced particulate emissions by 99%, metal emissions by 75% to 90% and sulphur dioxide emissions by 77%. Moreover, an ISO 14001-based management system being implemented promises to further improve environmental performance at the Trail facility.

Since its 1989 base year, the facility has achieved a total greenhouse gas reduction of 40%, a 20% drop in carbon energy consumption per tonne of production, and a one-third reduction in carbon dioxide produced per tonne of output. Significantly, these gains were accompanied by reduced operating costs.

In addition, by collecting and marketing the by-products of its pollution abatement efforts, the company has opened a new revenue stream that is making its environmental program even more cost-effective.



Energy efficiency makes | CORNER BROOK

Corner Brook Pulp and Paper Ltd. has demonstrated convincingly that cost reductions and energy efficiency go hand in hand.

PULP AND PAPER LTD. | a low-cost producer

In 1991, responding to the need to become a low-cost, high-quality producer, the Newfoundland forest products company made thermal energy conservation the top priority in its operations. With the strong commitment of mill management, the company launched an energy efficiency program supported by an awareness campaign to involve all employees in the hunt for energy savings.

The company identified and made easy-to-achieve changes first, then implemented an ongoing program to squeeze all the waste it could from its operations. Monthly energy reports provided the benchmarks to measure progress. The results have been impressive. From 1991 to early 1999, Corner Brook Pulp and Paper saved over $35 million in Bunker "C" oil alone.

Corner Brook Pulp and Paper has transformed itself from one of the industry's highest cost mills to one of the lowest, while at the same time improving the quality of its newsprint. It achieved this metamorphosis by making energy efficiency a major source of cost savings.

| EMCO LIMITED | Plant program is the

A recently launched program at EMCO Ltd.'s plant in LaSalle, Quebec, is demonstrating that energy efficiency also means operating efficiency. The plant, one of three EMCO manufacturing facilities in Canada, produces carton board, roofing shingles and asphalt paper for the construction industry. With an annual company-wide energy bill exceeding $11.5 million, EMCO knows that eliminating wasted energy will play a significant role in reducing its overall cost of operations.

Seeing opportunities for substantial energy cost reductions at the LaSalle plant, EMCO began by collecting basic energy usage data, then analysing it to pinpoint potential savings. The data revealed opportunities for energy cost reductions in virtually every corner of the plant's operations—from refining prices in energy utility contracts to investing in more efficient equipment—all of which will improve operating practices and maintenance procedures. An energy action plan is now addressing these opportunities.

Minimizing leakage and heat loss from the plant's steam and condensate system, along with better recovery of hot condensates, will save the plant tens of thousands of dollars every year. Improved efficiency and a new heat reclaimer in its combustion system will save thousands more. The plant is also introducing compressor, motor and insulation programs focused on eliminating wasted energy and cutting costs. Many of these gains can be achieved with minimal investment simply by initiating procedural improvements.

first step in journey toward energy efficiency

EMCO has established a 1% per year improvement in energy efficiency as its corporate goal. The model now being developed at the LaSalle plant could be the blueprint that enables the company to not only meet this target but exceed it.

LABATT BREWERIES OF CANADA

An audit of its powerhouse equipment and utility distribution systems in the early 1990s led Labatt Breweries of Canada to launch vigorous energy and water efficiency programs. The company sought to cut its production costs and at the same time reduce greenhouse gas emissions.

Beginning in 1992, Labatt launched an awareness campaign designed to help brewery employees understand the importance of energy efficiency and to encourage their participation in energy conservation programs. The company also began investing capital in the expansion of its network of flow meters, enabling breweries to measure power and water usage rates by department and even by machine. Labatt is following this program with the installation of utility monitoring and targeting software in all of its breweries.

The combination of management focus, employee participation and new equipment has paid significant dividends. Since 1991 the amount of water required to produce one hectolitre of beer has dropped from 13.4 to 9.3 hL, while fuel and electricity usage has decreased from 294.3 MJ/hL to 227.7 MJ/hL. Even excluding the reduction in effluent surcharges, savings generated by the program amount to $5.5 million annually.

Employee participation: the key to energy efficiency

Friendly competition among Labatt's breweries continues to foster further energy efficiency gains. By identifying one brewery as the facility with the "best practices," other breweries are encouraged to catch up, leading to a cycle of continuous improvement in energy efficiency across the company.

LAFARGE CANADA INC.

Thanks to a comprehensive company-wide program, Lafarge Canada Inc. has made impressive gains in energy efficiency. Now, thanks to a $140-million investment at its plant in Richmond, B.C., the world's second largest producer of cement will significantly enhance those gains.

Dry kiln technology slashes energy consumption

Lafarge replaced older, wet slurry "long" kilns with a modern, dry-process "short" kiln at the 40-year-old B.C. plant. In the wet slurry process, water is mixed with raw material to homogenize the mix and simplify material movement. This water must be evaporated during the manufacturing process, and is a major energy drain. Short dry kilns can operate at substantially less fuel per tonne of product than wet kilns because this energy-consuming step is not required. In addition, these kilns are equipped with higher efficiency heat exchange systems.

The results of the conversion are dramatic. The new kiln has cut energy consumption per tonne of product in half while substantially reducing regulated gas emissions. For example, SO_x and NO_x emissions are projected to decline by more than 25% and particulate emissions will fall by more than 40%. Lafarge expects that actual experience will prove these estimates to be conservative, with overall emissions actually declining despite the doubling of production.

In addition, by converting from a wet to a dry process, the company has reduced its water usage by millions of litres per year, further minimizing its impact on the environment.

Photo credit: Lorne Kemmet Photography

An intensive effort to reduce its cost of operations has steered century-old Lethbridge Iron Works down an energy efficiency path.

boosts energy and manufacturing efficiency

Efforts to save money led the southern Alberta foundry to introduce efficiency measures throughout its manufacturing processes. The company replaced its 70-year-old indirect arc furnaces with modern, energy-efficient coreless induction furnaces, a change that substantially reduced electrical power consumption. Nearly all process equipment has been fitted with programmable logic controllers, which automatically start and stop equipment as required, ensuring that it is running and consuming electricity only when production is underway. The company also scrapped an inefficient pneumatic return sand transport system and installed more power-efficient belt and bucket elevators.

A close look at its air handling systems led the foundry to install an automated damper system on its air compressors to keep process heat in the building during the winter. Makeup air units, which produced temperatures from 20°C to nearly 30°C, were recalibrated to perform at their specified 16°C. Old heating equipment was scrapped and replaced with modern, energy-efficient furnaces and heating units. Incandescent lighting was removed and high-efficiency compact flourescent systems were installed.

There is no doubt that aggressive energy efficiency efforts have enabled Lethbridge Iron Works to achieve substantial cost savings. With an ongoing program that builds energy efficiency into the equipment selection equation, the company will continue to add to its gains well into the future.


Maple Lodge FARMS

gains control of refrigeration energy costs

Maple Lodge Farms Ltd. faced a significant challenge. Canada's largest independent chicken processor needed to replace three independent systems with a sophisticated new control system for its refrigeration compressors without shutting down the plant or disrupting production. The results have been spectacular.

The company began by installing a Hench Controller Module from DML Control Inc. in Guelph, Ontario, for the plant's 2,900-hp refrigeration compressors. Incorporating an advanced sequencing strategy, the new module computes millions of possible permutations and automatically establishes the most efficient operating configuration. By taking advantage of inherent efficiencies available through the laws of refrigeration and the individual equipment at the site, the Hench system delivers more accurate pressure control and maximum operating efficiency.

Improvements were obvious from the first day of operation, as the company recorded an immediate 20% improvement in compressor efficiency. But that was just the beginning of the savings. Increased suction pressure has led to further annual compressor energy reductions of 8%. In addition, the system's sophisticated automatic sequencing control enables one or two compressors to handle loads previously carried by three, providing the plant with a total of 20% to 40% savings in annual compressor operating requirements.

Maple Lodge Farms estimates that its fully installed refrigeration control system paid for itself in energy savings within the first year, leading the firm to multiply its savings by installing additional Hench Controller Modules on its condensers and air compressors.

| NRI INDUSTRIES INC. | Investment slashes **emis**

Each year, about 300 million automotive tires are discarded in North America, a massive disposal problem that NRI Industries Inc. has turned into a recycling opportunity.

sions and energy consumption at two plants

Although it is already processing a significant portion of the continent's annual tire waste, the company recently installed a continuous cure press to increase its processing capacity by nearly 50%. NRI also invested in programs to make its two Toronto facilities cleaner and more energy efficient.

NRI installed new, high-efficiency boilers at its plants, significantly reducing both fuel consumption and the production of waste gases such as nitrous oxide, carbon monoxide and carbon dioxide. The boilers alone have slashed natural gas use by 43.4% at one plant and by 27.2% at the other. At its Cawthra plant, NRI has installed electrostatic precipitators in the exhaust system, enabling the facility to collect 97% of particulate emissions from its various manufacturing processes.

NRI Industries continues to introduce new solutions to an old industry. The innovative technologies it has developed and the investments it has made represent an economically sound and environmentally responsible solution to a major environmental problem.

OWENS CORNING CANADA | Carrying the energy

As a manufacturer of insulation for home, mechanical and commercial applications, Owens Corning Canada is intimately involved

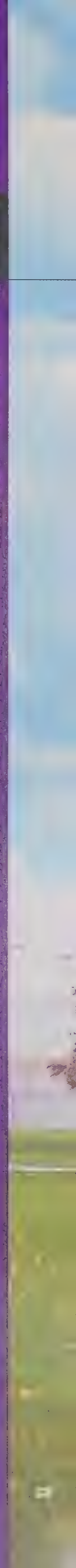
efficiency message to future generations

in energy conservation. By helping to minimize heat loss, the company's products have enabled customers across Canada to reduce their energy consumption. In addition, Owens Corning continues to improve the energy efficiency of the facilities and processes that make up its own operations.

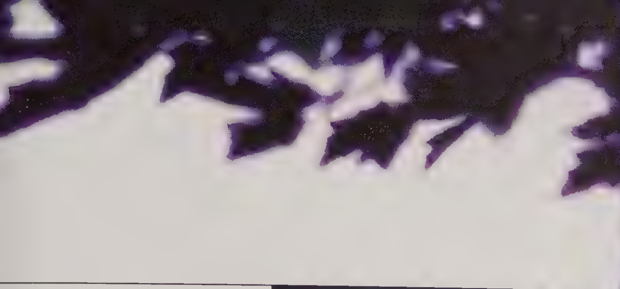
But one of the company's most significant contributions to the future of energy efficiency lies in a program it has sponsored for the past 20 years in conjunction with Lester B. Pearson Collegiate. Each year, dozens of grade nine geography students participate in a contest that awards prizes to the top eight submissions with an energy theme. Winning projects are generally outstanding, and the 1999 winners are no exception. An intricately detailed scale model home demonstrating energy leak points, and a dazzling working wind power model took this year's top prizes.

Winning entries are mounted in the lobby at Owens Corning's Scarborough plant, a display that never fails to attract the attention and respect of plant staff and visitors alike.

By encouraging students to focus their attention on energy and rewarding them for the creativity and hard work they apply to their projects, Owens Corning is helping to make energy a top-of-mind concern for future generations of leaders.



New Brunswick Division of the | POTASH CORPORATION OF SASKATCHEWAN INC



Producing potash takes large quantities of steam—steam to recover potash from dissolver tanks and more steam to operate the evaporator that is essential to the process. Making this steam takes a great deal of energy.

saves big by investing in energy efficiency

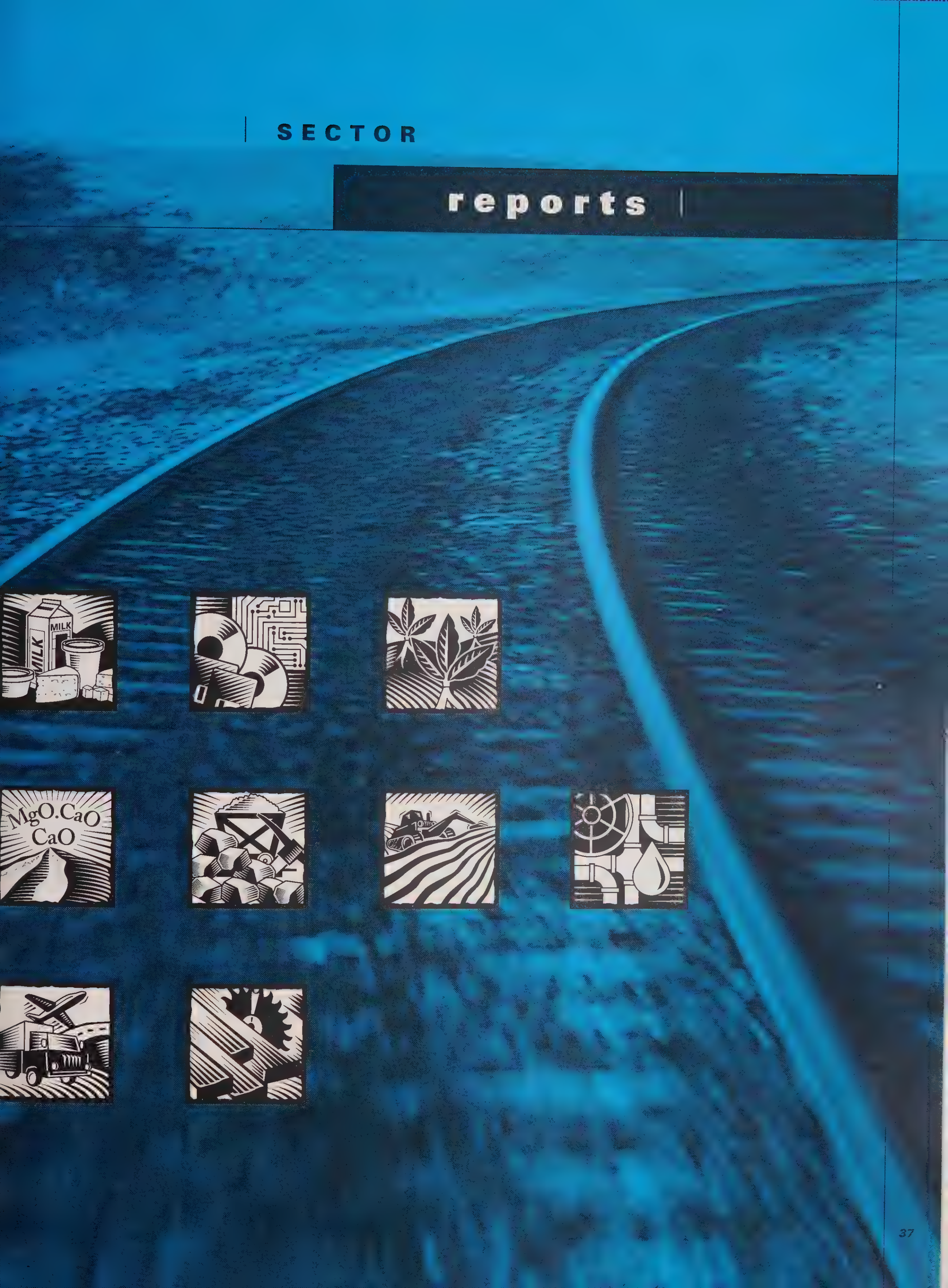
By recovering and reusing heat from its crystallizers, the New Brunswick Division of the Potash Corporation of Saskatchewan Inc. has substantially improved its energy efficiency. The Division launched a two-year, two-phase energy efficiency improvement project in 1998. The facility reduced the load on its cooling tower circulation loop by adding a shell and tube heat exchanger, enabling its potash mill to recover more of the energy contained in the cooling system's vapours. To achieve additional energy gains, improvements, modifications and investments were made throughout the process.

Although the project is still underway, the gains already achieved are impressive. Energy consumption per unit of output has dropped 30%. The project's success has enabled the mill to boost its recovery to 90% from a previous 86%, reduce its unit costs and produce an additional 43,000 tonnes of white murite.

The New Brunswick Division estimates a capital investment payback period of just two years, demonstrating once again that improving energy efficiency not only provides environmental benefits, it makes good business sense.


CEMENT

SECTOR reports



PROFILE *Canada's aluminum sector ranks fourth in the world in annual primary aluminum production. The combined output of the industry's 10 aluminum plants in Quebec and one in British Columbia is a major contributor to Canada's national and local economies. While production increases have forced the industry's total energy usage slightly upward, measurements of energy efficiency continue to demonstrate much improved performance compared with the benchmark 1990 levels.*

ALUMINUM

ACTIONS Reductions in the electrical power needed to produce aluminum can have a substantial impact on production costs. This fact has helped spur cooperative efforts to achieve industry-wide improvements in energy efficiency. In 1998, the aluminum sector set as its goal a 0.1 percent per year improvement in energy efficiency.

Individually and collectively, members of the aluminum sector continue to actively pursue energy efficiency improvements toward this goal. Ongoing process improvements are chipping away at energy consumption, while capital improvements are dramatically improving the industry's performance.

For example, Alcan Aluminium Limited will construct a new, $2.6 billion smelter in Alma, Quebec. With a rated capacity of 376 000 tonnes of primary aluminum, this smelter will use energy-efficient AP-30 Pechiney technology and enable the company to close its old, less efficient Isle-Maligne facility.

Cooperative efforts are also reducing energy intensity. Through committees, working groups and special studies, the aluminum industry is actively monitoring and pursuing technological advances that promise enhanced energy efficiency. Within member companies, committees are working on energy efficiency issues, and companies regularly share energy efficiency information in non-competitive areas.

ACHIEVEMENTS Since 1990, the aluminum sector has reduced its emissions of tetrafluoroethane (CF_4) and hexafluoroethane (C_2F_6) by nearly 30 percent, with a target reduction totalling 50 percent by the year 2000.

From 1990 to 1998, the sector increased aluminum production by more than 51 percent while steadily reducing energy consumption per unit of production and also reducing GHG emissions per unit of production by 41 percent.

Along with improved energy efficiency in the production of primary aluminum, the sector has also set the expansion of aluminum recycling as a sectoral priority. Aluminum is fully recyclable, and reforming scrap into useful metal requires only 5 percent of the energy consumed in the production of primary aluminum.

In addition, the aluminum industry has targeted the eventual elimination of anode effects, which generate CF_4 and C_2F_6, helping to reduce its GHG emissions and carbon dioxide (CO_2) equivalent. The sector believes it is in an excellent position to meet Canada's commitment to reduce greenhouse gas emissions to a total of 6 percent below 1990 levels by 2012.

CHALLENGES In 1998, the sector's output was similar to 1997 levels at 2.4 million tonnes of primary aluminum, but low prices on the world market reduced the value of production to $5.2 billion. Weaker prices will have an impact on the industry's progress toward energy efficiency. While small gains will continue to be realized through enhanced processes, the most significant improvements will come from the construction of new, state-of-the-art smelters and the phasing out of older facilities. This activity requires large capital investments and the availability of large quantities of electricity at highly competitive prices. Low aluminum prices will challenge the industry's ability to finance these investments.

Moreover, 70 percent of total aluminum production already comes from modern facilities, and developing effective economic models for the continued introduction and funding of new facilities remains a significant industry challenge.

The aluminum industry estimates that the production of each tonne of aluminum consumed on average less than 67 GJ. This demonstrates a slight decrease in energy use while the sector's total 1998 production increased.

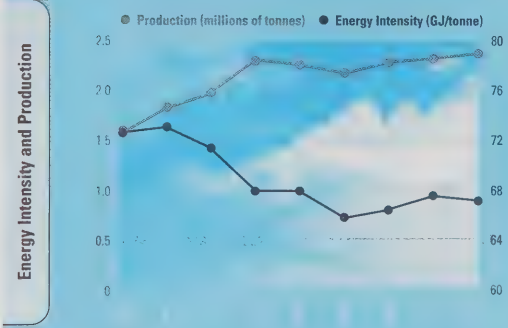
Owing mainly to the erroneous classification of some Alcan facilities, the data on energy consumption published last year and this year are incorrect. In 1999, Alcan and Statistics Canada agreed on a revised classification of the Alcan facilities to resolve the problem.

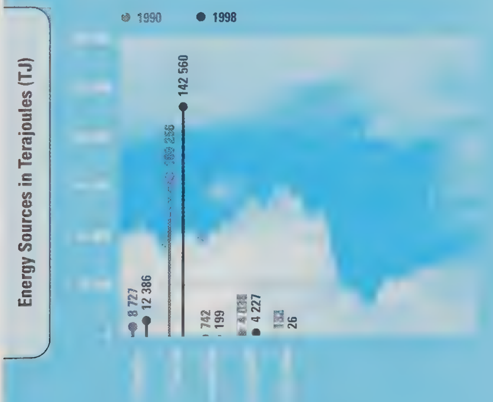
FACTS

PERFORMANCE HIGHLIGHTS

- Canada's aluminum sector ranks fourth in the world in primary aluminum production.
- Measurements of energy efficiency demonstrate much improved performance compared with benchmark 1990 levels.
- Alcan will construct a new, $2.6-billion smelter in Alma that will use energy-efficient AP-30 Pechiney technology.
- Through committees, working groups and special studies, the industry is actively pursuing technological advances that promise enhanced energy efficiency.
- Since 1990, the sector has reduced its CF_4 and C_2F_6 emissions by nearly 30 percent.
- From 1990 to 1998, the sector increased production by 51 percent while reducing its GHG emissions per unit of production by 41 percent.

FIGURES





PROFILE *Brewing in Canada is a diverse and modern industry actively pursuing ambitious energy efficiency targets. The industry is made up of two national brewing companies, several regional brewers and numerous micro breweries. Together, these establishments employ nearly 17 000 workers in 78 breweries across Canada.*

BREWERY

ACTIONS In 1998, Canada's brewers continued to invest in efforts to improve energy efficiency. Various brewers made capital investments and undertook significant projects in a number of areas, including

- the installation of equipment to recover condensate and steam in areas where such opportunities exist;
- the replacement of older equipment with new, more energy-efficient alternatives;
- the removal of unnecessary lighting; and
- the replacement of lighting equipment with more energy-efficient alternatives.

Rigorous maintenance and monitoring activities also remained a focus. Enhanced metering, monitoring and control equipment and procedures have enabled brewers to identify opportunities for improvement and implement energy-saving measures. Energy audits and the establishment of energy accountability centres are sharpening the focus on energy waste reduction and creating opportunities for innovation in the pursuit of energy conservation.

The industry has also remained active in energy efficiency initiatives collectively. In November 1998, the Brewers Association of Canada Environment Committee, with NRCan support, released an energy efficiency guide for brewers. The guide highlights a vast array of energy-saving opportunities and identifies ways that energy efficiency activities can reduce costs within a brewery. The guide is an excellent reference for individual energy efficiency action plans and will further efforts to sustain the sector's energy reduction performance.

ACHIEVEMENTS Canada's brewing industry continues to trim the amount of fuel and electricity consumed despite several years of stagnant production. The sector's energy mix includes 71 percent natural gas, 6 percent fuel oil and 23 percent electricity.

Since 1995, the industry has reduced its energy consumption by 6.7 percent while improving its economic efficiency. The brewing industry is committed to an energy reduction of 1 percent per year over the next three years and, beginning in 2004, 1.5 percent annually for three more years.

CHALLENGES Cost control is a priority for the brewing industry. Flat sales since about 1975, greater competition from foreign brewers, increased competition from other products such as coolers, and growth in non-taxed alternatives such as beer produced from kits and at u-brews have combined to weaken both sales and profitability.

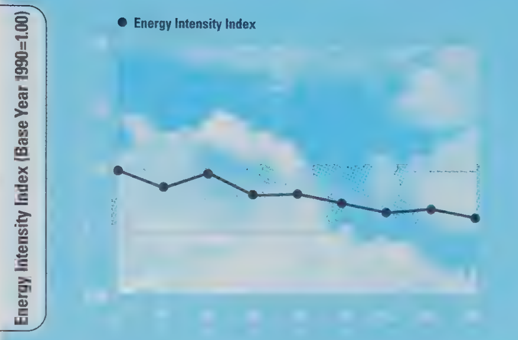
Brewers have responded to these challenges by developing export strategies that make Canada one of the top beer exporters in the world. Canada's brewers have also negotiated agreements that enable them to produce a number of products in Canada that would otherwise be imported. With more than 400 distinct brands now available in the Canadian market, from traditional ales and lagers to new products with varying strengths of alcohol, flavours and textures, the industry is well positioned to meet its competition head on. Product and marketing innovations notwithstanding, energy remains a substantial cost component in the brewing process. Finding ways to improve energy efficiency is, therefore, a priority for Canada's brewers.

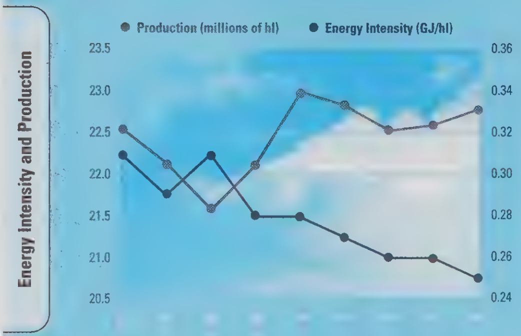
FIGURES

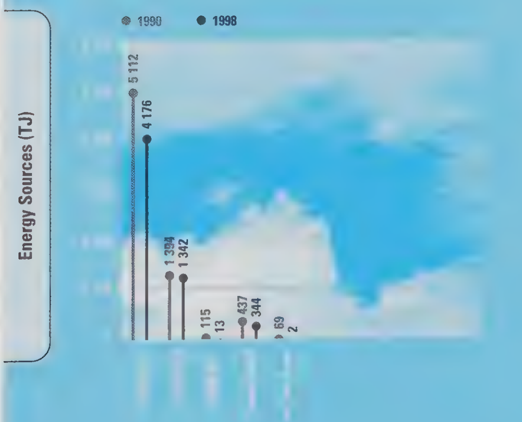
FACTS

PERFORMANCE HIGHLIGHTS

- The brewery sector employs nearly 17 000 workers in 78 breweries across Canada.
- Enhanced metering, monitoring and control equipment and procedures have enabled brewers to identify opportunities for improvement and implement energy-saving measures.
- In November 1998, the Brewers Association of Canada Environment Committee, with NRCan support, released an energy efficiency guide for brewers.
- Since 1995, the industry has reduced its energy consumption by 6.7 percent while improving its economic efficiency.
- The industry is committed to an energy reduction of 1 percent per year over the next three years and, beginning in 2004, 1.5 percent annually for three more years.







PROFILE *The cement industry is the cornerstone of Canada's domestic construction industries and a significant exporter that contributes substantially to the country's balance of payments. The industry's nine companies, which operate 17 manufacturing facilities with a combined production capacity of 12.1 million tonnes of clinker, saw a 2.5-percent increase in shipments in 1998.*

CEMENT

ACTIONS Cement manufacturers continued to invest in energy efficiency in 1998. For example, at Blue Circle Canada Inc.'s Bowmanville, Ontario, facility, the company replaced the inlet fan damper in the coal mill with a variable inlet vane damper, reducing power consumption and saving the company approximately $75,000 in energy expenditures.

At its Picton, Ontario, facility, ESSROC Canada Inc. installed an electricity-use monitoring system that is now helping the plant improve its electrical energy efficiency.

A new, energy-efficient dry kiln is now in operation at Lafarge Canada Inc.'s Richmond, B.C., plant, replacing the plant's older wet kilns. When preliminary numbers are analysed, Lafarge Canada expects the new kiln to cut energy consumption per tonne of clinker in half.

Tilbury Cement Limited in Delta, British Columbia, has eliminated approximately 6 percent of its fossil fuel consumption by recovering energy from waste oil and discarded tires.

The cement sector is also actively promoting energy issues through its industry association. The industry participates in the "Buildings Industry Table" developed by the government in response to the challenge of the Kyoto Protocol and holds regular environmental committee meetings. The Canadian Portland Cement Association is also actively involved in collecting information related to energy savings, emissions and the energy-efficient application of its products.

Among the association's recent projects are "Environmental Life Cycle Assessment of Concrete Products: Portland Cement Concrete and Asphalt and Concrete Pavements," "Environmental Life Cycle Assessment of Concrete Products: Portland Cement Concrete and Wood Residential Structures," and "CO_2 Literature Search Regarding CO_2 Sinks" as they relate to concrete structures.

ACHIEVEMENTS The Canadian Portland Cement Association estimates that by 2000, total emissions associated with domestic cement consumption will be 6 percent below 1990 levels. This projection is based on an estimated 12 percent increase in domestic consumption between 1997 and 2000. Associated emissions per tonne of concrete product should show a 14 percent decrease in CO_2 compared with 1990. Moreover, clinker capacity utilization rates increased by an impressive 4 percent from 1997 to 1998, whereas cement shipments rose 2.5 percent.

Within the industry, cement manufacturers have achieved a 30 percent energy reduction per tonne of output since the mid-1970s by converting from wet to dry manufacturing processes and improving heat-recovery systems. Emissions have been reduced by incorporating fly ash, silica fume and blast furnace slag into concrete as a supplement. Manufacturers continue to improve environmental performance by augmenting the use of waste materials and fuels in the production process.

The principal energy sources used for cement production are coal, natural gas and petroleum coke. In 1998, the use of alternative fuels (wood waste and waste fuel) increased to 6 025 terajoules (TJ), or 9.7 percent of total energy used. Since 1990, the cement sector has reduced its total energy use by more than 4.7 percent.

The expanded use of activities such as power monitoring and targeting will lead to further energy efficiency opportunities within the sector. The industry expects further increases in energy efficiency as companies continue to modernize their facilities and processes.

CHALLENGES The cement sector's energy intensity target is an improvement of 0.7 percent per year through the year 2000. Success in reaching this goal depends on continued strong demand for the industry's products, along with the acceptance of standard methodologies for measuring waste fuel efficiencies and energy embodied in export products.

Long-standing discussions among waste producers and waste users have not yet yielded an appropriate methodology to establish emission-related credits for waste material use in the production of cement. In a broader context, complex international negotiations continue to delay the establishment of standardized accounting methods for energy embodied in cement exports. Additionally, the potential implementation of economic instruments such as a "carbon tax" could seriously impair Canada's cement exports.

Moreover, while many cement producers would gladly expand the use of waste materials such as discarded tires as fuel, landfill fees for discarded tires are too low in many jurisdictions to provide the financial incentives to encourage such use.

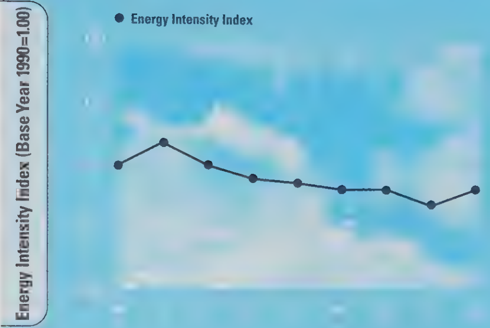
Despite the obstacles, the industry continues to promote concrete as an energy-efficient product and to make cement and concrete the materials of choice for environmentally responsible industries. It is also continuing to develop an appropriate methodology for life cycle assessment of cement-based materials and products.

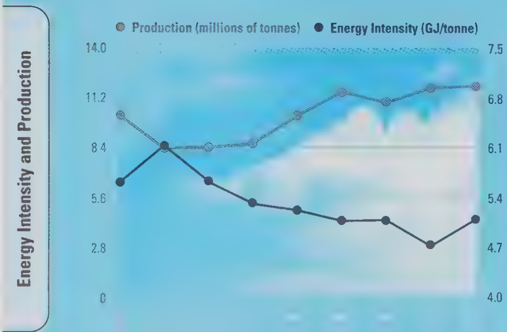
FACTS

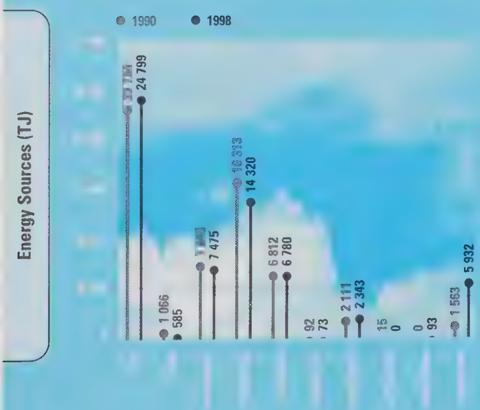
PERFORMANCE HIGHLIGHTS

- The cement sector saw a 2.5-percent increase in shipments in 1998.
- Blue Circle Canada reduced power consumption at its Bowmanville facility, saving the company $75,000 in energy expenditures.
- ESSROC Canada installed an electricity-use monitoring system that is now helping its Picton plant improve its electrical energy efficiency.
- Lafarge Canada's new Richmond kiln will cut energy consumption per tonne of clinker in half.
- B.C.'s Tilbury Cement has cut fossil fuel consumption by recovering energy from waste oil and discarded tires.
- The Canadian Portland Cement Association estimates that by 2000, total emissions associated with domestic cement consumption will be 6 percent below 1990 levels.

FIGURES

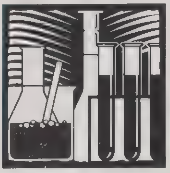






PROFILE *The chemical sector is a diverse industry producing organic and inorganic chemicals, as well as plastics and synthetic resins. Companies in this sector operate 775 facilities Canada-wide, directly employing more than 24 000 people with an annual payroll of $1.3 billion.*

CHEMICALS



ACTIONS Nearly all chemical industry subsectors are meeting their energy-intensity performance targets, matching, and in some cases substantially improving on, benchmark 1990 levels. Contributing to the sector's performance, the installation of cogeneration facilities results in more efficient use of hydrocarbon fuels to generate heat, steam and electricity. In a recent survey of Canadian Chemical Producers' Association (CCPA) members, respondents accounting for 82 percent of CO_2 emissions indicated in aggregate that 49 percent of electricity and 44 percent of steam requirements are currently being met by cogeneration. By 2010, cogeneration is expected to account for 78 percent of electricity and 67 percent of steam required.

All CCPA member companies must subscribe to the association's Responsible Care® initiative. Responsible Care® establishes guiding principles and codes of practice covering all aspects of the chemical life cycle, including the requirement that each member report annually on the emission of as many as 500 substances. A strong supporter of the VCR Inc., the CCPA requires members that are large emitters of CO_2 to register and encourages members with lower emissions to do so as well.

Individual manufacturers have also taken noteworthy actions in 1998, for example,

- NOVA Chemicals Corporation plans to build a $355 million cogeneration plant at its Joffre, Alberta, site. This facility will not only supply all of the site's steam and electricity needs but also will supply electricity to the Alberta Interconnected System, reducing indirect emissions of GHGs by system users by approximately 2 546 kilotonnes annually. NOVA has also initiated a flare-reduction program at its Corunna, Ontario, facility aimed at reducing emissions (consisting mostly of C4s, ethylene and propylene) and improving fuel efficiency. Under the program, measures have been taken to reduce fuel gas system pressures, to minimize flaring at start-up, to quickly identify flare sources and to report monthly to management. Compared with 1998, year-to-date flare losses have been reduced by $3 million and approximately 14.6 kilotonnes. The project team will continue its work in 2000.
- DuPont Canada Inc. is continuing to improve the efficiency of the nitrous oxide abatement facility started in 1997 at its Maitland, Ontario, site. The facility attained 53.7 percent abatement efficiency in 1998, with a goal of 90 percent in 2000. In addition, DuPont expects to achieve a 15 percent reduction in unit energy use between 1995 and 2005.
- Dow Chemical Canada Inc. has committed to improve energy efficiency per kilogram of product manufactured by 20 percent from 1994 to 2005. One project that will help accomplish this goal is the construction of a highly efficient cogeneration facility at Dow's Fort Saskatchewan site. This facility is expected to reduce Dow's attributed CO_2 emissions by approximately 400 kilotonnes per year.

ACHIEVEMENTS The chemical sector continues to combine capital investment and innovative process improvements to keep reducing its emissions per unit of output. In addition, the sector and its trade association remain focused on enhancing energy-use management, including public reporting on the sector's energy efficiency performance.

In 1998, the sector's energy consumption, at 219 311 TJ, was a modest increase over 1990 levels. However, the constant dollar value of its products increased substantially, about 18 percent over 1990 values and 1 percent from 1997 to 1998. Since 1992, the constant dollar value of the sector's output increased by 27 percent while its total GHG emissions in equivalent CO_2 tonnes have decreased 21 percent. Although direct CO_2 emissions increased 4 percent, emissions per unit of output decreased by 18 percent. In total, the global warming potential per unit of output has decreased by 38 percent.

Cogeneration is helping the sector to continue to register significant energy efficiency gains as well as reductions in GHG emissions per unit of output. In fact, thanks to the active stewardship of its members, the CCPA estimates that by the year 2003, CO_2 emissions per unit of output will remain at 18 percent below 1992 levels.

The chemical sector remains a staunch supporter of the VCR Inc., and companies continue to support their membership with significant actions. For example, over the past year, four CCPA companies, responsible for more than 70 percent of the sector's CO_2 emissions, attained significant Champion reporting levels: Celanese Canada Inc. and DuPont reached Silver, and Dow and NOVA reached Gold. DuPont also received a 1998 VCR Leadership Award.

For more information about climate change and the chemical industry, visit the CCPA Web site at www.ccpa.ca.

CHALLENGES Energy efficiency is closely linked to competitive patterns within the chemical industry, resulting in incremental improvements in energy-use patterns, rather than dramatic changes. Similarly, the industry's current strong growth makes it likely that while CO_2 emissions per unit of output will continue to improve, total CO_2 emissions will grow.

The chemical industry's use of natural gas and petroleum distillates as a feedstock complicates the creation of accurate sector energy data. To ensure accurate and consistent reporting of energy consumption, the CCPA is working with several government agencies on how to improve sector energy consumption measurement and reporting.

FACTS

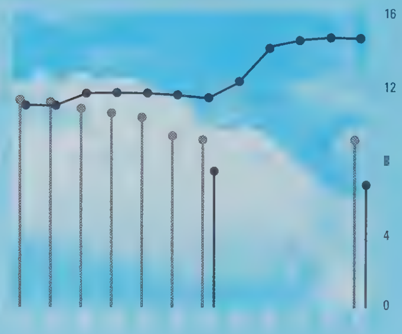
PERFORMANCE HIGHLIGHTS

- The chemical sector operates 775 facilities Canada-wide, directly employing more than 24 000 people.
- Nearly all industry subsectors are meeting their energy-intensity performance targets.
- In aggregate, cogeneration is currently meeting 49 percent of the sector's electricity and 44 percent of its steam requirements.
- NOVA Chemicals plans to build a major cogeneration plant at its Joffre site.
- DuPont Canada continues to improve the efficiency of the nitrous oxide abatement facility at its Maitland site.
- Dow Chemical Canada has committed to improve energy efficiency per kilogram of product manufactured by 20 percent between 1994 and 2005.
- The global warming potential per unit of output in the sector has decreased by 38 percent.

FIGURES

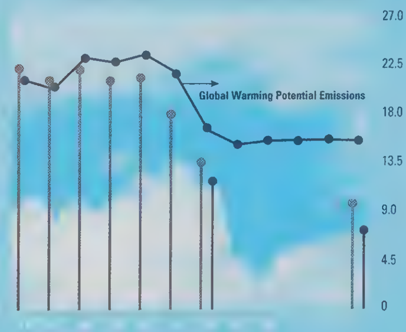
CO_2 Emissions in Millions of Tonnes and per Unit of Output (1992 = 100)

- CO_2 Emissions per Unit of Output (1992 = 100)
- CO_2 Emissions (Excluding Cogen) per Unit of Output (1992 = 100)
- CO_2 Emissions in Millions of Tonnes



Global Warming Potential of Emissions from CCPA Member Operations (Shown as Equivalent CO_2 Tonnes and per Unit of Output)

- Global Warming Potential per Unit of Output (1992 = 100)
- Global Warming Potential per Unit of Output (Excluding Cogen)
- Global Warming Potential (Million Tonnes of CO_2 Equivalents)



Notes

1. Emission forecasts from member companies are assumed to take into account announced capacity increases.
2. Historical chemical output was calculated using constant 1992 dollars, taking into account annual average chemical pricing changes as a way of converting sales dollars into tonnage.
3. Chemical output is forecast to grow 5 percent per annum from 1997 to 2002 based only on announced projects.
4. About 10 percent of the output is from non-CCPA member companies; emissions are from member companies only.

PROFILE *Canada's dairy product manufacturing sector spans the country from coast to coast. Employing 20 500 people in more than 270 facilities, Canada's dairies processed more than 74 million hectolitres of raw milk and shipped an estimated $8.3 billion worth of milk products in 1998.*

DAIRY

ACTIONS Dairy product manufacturers use energy for such processes as pasteurization, churning, washing, packaging, cooling, freezing and drying, making energy a key component in milk processing. Typically, dairies employ electrical, thermal and water-based energy systems in their facilities.

The importance of energy to the sector has led the National Dairy Council of Canada to promote industry-wide participation in energy efficiency efforts. Each product subsector is encouraged to implement its own low-cost, no-cost and retrofit improvements in dozens of plant operations. These improvements include everything from thermal storage of recovered hot water to exterior tanker recycled water washes and improved control of air and water leakage. Companies seeking to make such improvements are provided with information on expected cost savings and payback periods. Moreover, the National Dairy Council of Canada, in partnership with NRCan, supports the energy efficiency achievements of dairy plant managers through research and educational materials.

New energy-saving technologies, including expert control systems, non-thermal pasteurization systems, pulsed drying systems and just-in-time dairy manufacturing concepts, have also attracted the industry's attention. Training is available to help energy managers measure energy efficiency and to direct them to research from around the world on successful dairy product energy-management strategies and practices.

National Dairy Council staff and member companies are working with the Competitive Analysis Centre Inc. on an extensive examination of energy use by fluid milk processors. Through the analysis of data collected from 17 different fluid milk plants located across Canada, the study will provide dairies with valuable energy performance indicator information. The study is expected to be completed by the summer of 2000.

ACHIEVEMENTS Canadian dairy product manufacturers and marketers are facing increased competition in both domestic and world markets as increasingly liberalized international trade leads to more heavily integrated world markets. To remain competitive in an environment of rapid change, the sector has successfully lowered its costs through improved energy efficiency. Moreover, to bolster its domestic markets, Canadian dairy product manufacturers continue to reinforce the image of Canadian milk products as wholesome, high-quality, competitively priced food sources.

In 1998, the dairy product manufacturing sector's total energy consumption was 12 737 TJ, up slightly from the 1990 level of 11 952 TJ, with the amount of milk and cream produced in 1998 also up from 1990 levels. Except for a peak year in 1994, energy intensity remained at or below the 1990 level until 1996 when energy intensity increased. This increase can be attributed to production line changes made by the industry to meet consumer demand for products that require more energy to produce.

CHALLENGES Improving energy efficiency is a significant challenge for dairy product manufacturers. Industry rationalization and competitive pressures continue to drive the industry to reduce excess capacity while retaining and expanding market share. Furthermore, international scrutiny resulting from a World Trade Organization ruling against Canada's dairy export regime has created intense internal pressure on Canadian dairy industry stakeholders as they search for the best way to implement the ruling.

A fundamental challenge is inherent in the requirement for dairy product manufacturers and marketers to provide high-quality, value-added products to consumers at the best possible prices while the main source of their products is a highly regulated, supply-managed raw milk production sector.

The recent trend toward extended shelf life (ESL) products has also boosted energy consumption. Producing ESL products requires ultra-high-temperature pasteurization and the use of special filters, and such alterations in processing require significantly more energy per unit of output. All of these forces have combined to make productivity and cost reduction key industry issues.

Manufacturers have made most of the low-cost and no-cost energy efficiency improvements available to them. Their greatest challenge is to make the more costly, payback-delayed improvements, especially given the ever-increasing economic pressures of a highly competitive market.

FIGURES

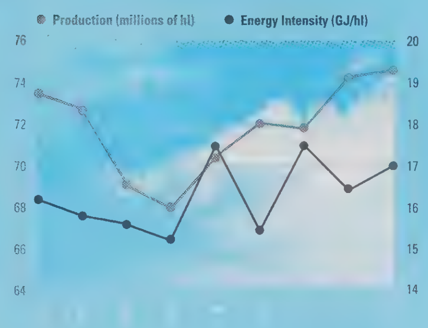
FACTS

PERFORMANCE HIGHLIGHTS

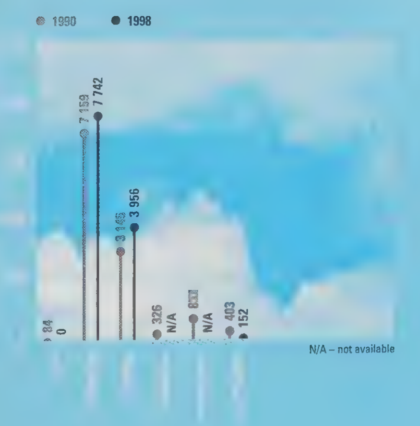
- Canada's dairies shipped products worth an estimated $8.3 billion in 1998.
- Canadian dairy product manufacturers and marketers face increased competition in both domestic and world markets as liberalized international trade leads to more heavily integrated world markets.
- National Dairy Council staff and member companies are working with the Competitive Analysis Centre on an extensive examination of energy use by fluid milk processors.
- In 1998, the sector's total energy consumption was 12 737 TJ, up slightly from the 1990 level of 11 952 TJ.
- Since 1996, energy intensity has increased owing to consumer demand for dairy products that require more energy to produce.

Energy Intensity Index (Base Year 1990=1.00)

Energy Intensity and Production

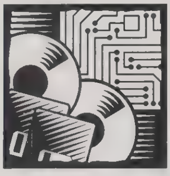


Energy Sources (TJ)



PROFILE *The electrical and electronics sector includes a diverse array of companies that produce electrical appliances, lighting, consumer electronics, communication and electronic equipment, cabling, office equipment, industrial equipment and other electrical products. These companies operate more than 1 400 facilities employing over 119 600 workers across Canada. The industry is a major exporter and a vital, growing contributor to the national economy. In 1998, total shipments reached $15.7 billion, 13.6 percent of the total for all Canadian manufacturing.*

ELECTRICAL AND ELECTRONICS



ACTIONS Although the industry as a whole has yet to adopt increased energy efficiency as a mission-critical target, companies within the sector have launched their own energy programs. Electrical and electronics manufacturers are also acting in concert through the Electro-Federation Canada to establish and promote energy efficiency standards for consumer, commercial and industrial products.

ACHIEVEMENTS Between 1990 and 1998, the electrical and electronics sector's gross domestic product (GDP) increased by about 92 percent. In 1998, the industry consumed 17 209 TJ of energy, representing about 0.7 percent of the energy consumed by the manufacturing sector as a whole and about 0.1 percent of total energy-related manufacturing CO_2 emissions. On average, expenditures on energy are equivalent to less than 1 percent of the value of the industry's shipments, compared with more than 61 percent for materials and supplies, and 16 percent for labour. Natural gas and electricity satisfy virtually all of the industry's energy requirements.

Between 1990 and the end of 1998, the sector's energy consumption decreased by 6 percent despite substantial growth in production. These factors have combined to decrease energy intensity by almost 50 percent. Moreover, efficiencies of scale brought about by the consolidation of manufacturing operations and distribution channels (through acquisitions and mergers) led the industry to project a decrease in energy consumption of one third over the next decade. In fact, despite the challenges it faces, the electrical and electronics sector is ahead of its Kyoto commitment.

Regardless of global pressures, many corporations remain committed to environmental programs and sustainable development, and continue to include energy efficiency as a vital component of their efforts to control costs.

Many of the sector's manufacturers make a significant contribution to decreasing CO_2 emissions through the products they manufacture and sell. Products ranging from oil refinery control systems to high-efficiency motors and lighting are used directly by other companies to decrease their energy consumption.

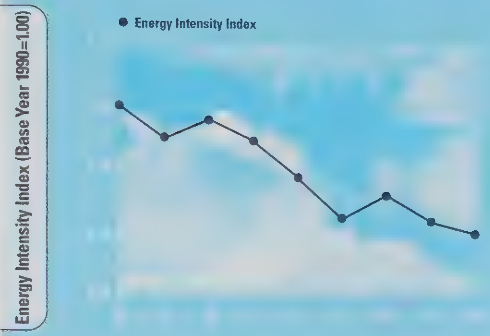
CHALLENGES The electrical and electronics sector is Canada's least energy-intensive industry. As a result, many manufacturers consider GHG emissions and energy efficiency less critical to the industry's health than technological change, market growth, and sales and distribution issues. Many manufacturers fear that unilateral Canadian actions to reduce GHG emissions in response to the Kyoto commitment place their plants at a competitive disadvantage compared with foreign-based plants with fewer environmental constraints. And for most companies, with a primary focus on the next two fiscal quarters, the long-term commitment to targets as far as a decade away may appear unrealistic.

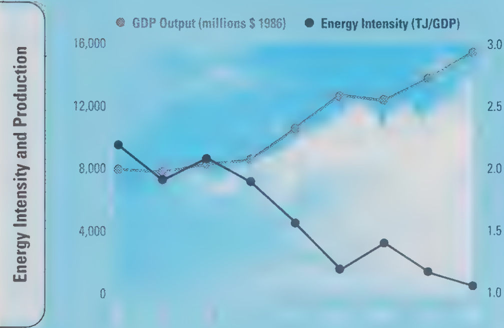
FACTS

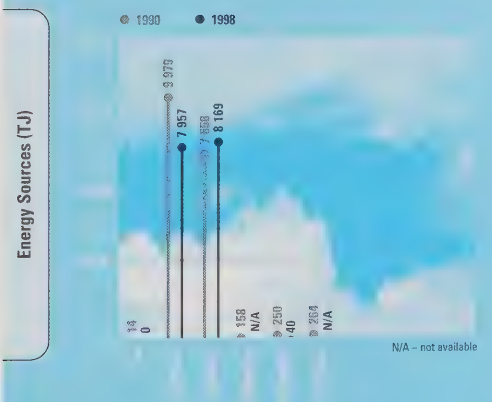
PERFORMANCE HIGHLIGHTS

- The electrical and electronics sector is Canada's least energy-intensive industry.
- Average energy expenditures are less than 1 percent of the value of the industry's shipments, compared with more than 61 percent for materials and supplies, and 16 percent for labour.
- In 1998, total sector shipments reached $15.7 billion, 13.6 percent of the total for all Canadian manufacturing.
- Between 1990 and the end of 1998, the sector's energy consumption decreased by 6 percent despite substantial growth in production.
- Consolidation led the industry to project a decrease of one third in energy consumption over the next decade, ahead of its Kyoto commitments.
- Many sector manufacturers make a significant contribution to decreasing CO_2 emissions by increasing the energy efficiency of the products they manufacture and sell.

FIGURES







PROFILE Canada's fertilizer industry is one of the world's major producers and exporters of nitrogen, potash and sulphur fertilizers, manufacturing 12 percent of the world's total fertilizer output. Companies in this sector operate more than 30 production facilities.

FERTILIZER

ACTIONS To better measure energy-use patterns and monitor energy efficiency improvements, a fertilizer industry task force is developing baseline information on the sector's energy use. In addition, the Canadian Fertilizer Institute (CFI) and Agriculture and Agri-Food Canada have developed a research program to identify optimal methods of fertilizer use.

Fertilizer manufacturers regard information on their specific activities as confidential. However, the Canadian fertilizer industry is already among the most energy-efficient compared with its global competitors, and economic and environmental factors are leading companies in the sector to continue to develop and employ energy-efficient new technologies. The international focus on climate change provides additional impetus to maximize energy intensity and limit GHG emissions.

ACHIEVEMENTS The fertilizer industry's domestic agriculture sales total more than $2 billion annually, through a network that exceeds 1 500 distributors and retailers across the country. The manufacture, distribution and sales of fertilizer products employ about 12 000 people from coast to coast. Total shipments of approximately 24 million tonnes are valued at about $5.5 billion. More than 75 percent of these shipments are exported, with two thirds of exports to U.S. farmers.

Fertilizer production is energy-intensive, making energy efficiency a key industry priority. Their efforts have made Canadian fertilizer manufacturers acknowledged world leaders in sectoral energy efficiency and emissions control. In fact, its success in reducing energy intensity is a major factor in the industry's ability to remain internationally competitive.

Much of the natural gas consumed by the sector is used as a feedstock to generate hydrogen, an essential ingredient in the production of ammonia. Production efficiency, particularly of nitrogenous fertilizers, has improved over the last 10 years, hence the increase in natural gas consumption owing largely to increased volume of fertilizer produced.

Since 1990, potash production has increased 24 percent for a total of 9.197 million tonnes in 1998. Over the same period, energy consumption by potash producers has risen but the energy component per tonne has declined from 3.92 GJ per tonne in 1990 to 3.72 GJ per tonne of output in 1998. Overall, energy indicators show an improvement in energy intensity that averages more than 1 percent per year since 1990.

According to CIEEDAC, nitrogen fertilizer production increased from 5.44 million tonnes in 1990 to 5.74 million tonnes in 1998, while the CFI database shows production totals of 7.7 million tonnes for 1990 and 11.1 million tonnes for 1998. Similarly, CIEEDAC reports energy consumption of 35 908 TJ in 1990 and 64 326 TJ in 1998, whereas CFI data does not support this magnitude of increase in energy consumption. The CFI believes that there is a strong possibility that current surveys include in the energy consumption data some of the natural gas used as a feedstock in the production of ammonia. The fertilizer industry task force is working to address the issue of data inconsistency.

CHALLENGES Fertilizers play an important role in maintaining and restoring atmospheric health. Just as animals, humans and human technological activities consume oxygen and release CO_2, plants absorb CO_2 and release oxygen. When in harmony, these forces create a stable, but delicate, balance of gases in the atmosphere. By increasing the plant biomass that absorbs CO_2 and produces oxygen, fertilizers help to reinforce the natural balance. Recognizing the important environmental role the industry plays, the CFI has embarked on collaborative research to identify agricultural practices that maximize CO_2 removal from the atmosphere.

The fertilizer industry faces a significant global challenge. Rapid world population growth combined with limited and diminishing productive crop land is taxing humanity's ability to produce enough food to feed the worldwide population. For the agricultural industry to sustain and boost its production, high-yield practices must be embraced. Consequently, the fertilizer industry must be prepared to make a vital contribution to the sustainability of global food production by focusing on the responsible production and use of fertilizer to nourish the world's soil.

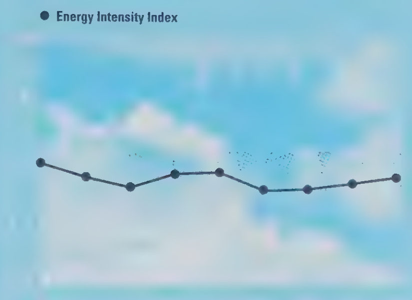
FACTS

PERFORMANCE HIGHLIGHTS

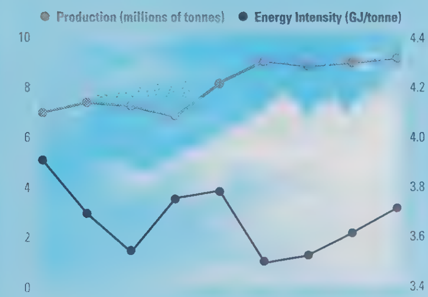
- Canada's fertilizer industry is one of the world's major producers and exporters of nitrogen, potash and sulphur fertilizers.
- The Canadian industry is among the most energy-efficient compared with its global competitors.
- An industry task force is developing baseline energy consumption information to better measure use patterns and monitor improvements.
- The industry's domestic agriculture sales total more than $2 billion annually, supporting a network of more than 1 500 distributors and retailers across the country.
- Total Canadian shipments are approximately 24 million tonnes, valued at approximately $5.5 billion.
- Nitrogen fertilizer production increased from 5.44 million tonnes in 1990 to 5.74 million tonnes in 1998.

FIGURES

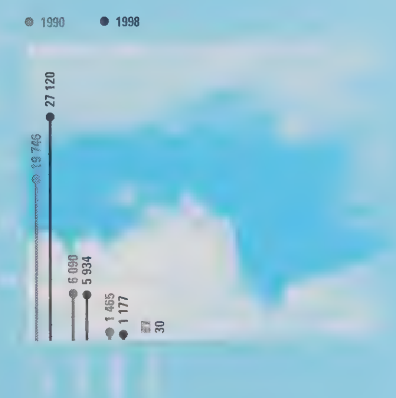
Energy Intensity Index (Base Year 1990=1.00)



Energy Intensity and Production



Energy Sources (TJ)



PROFILE *Canada's food processing sector includes manufacturers producing a diverse range of products, including meat, poultry, fruit and vegetables, flour and bakery products, oils and sugars, coffee, snack foods and confections. Sector members operate approximately 3 000 establishments and employ about 200 000 people across the country.*

FOOD PROCESSING

ACTIONS Early in its existence, the Food Processing Task Force set the following goals:

- confirm the quality of baseline data;
- broaden membership in the task force and increase awareness of CIPEC by signing letters of cooperation with key food industry associations;
- hold an energy efficiency seminar tailored to the food processing sector; and
- identify a food processing CEO to act as "champion" for the sector.

In 1999, the task force was able to deliver on three of these four objectives. There is now general satisfaction among task force members concerning the quality of the data collected and reported by Statistics Canada.

The Food and Consumer Products Manufacturers of Canada (FCPMC), an industry association with more than 180 members, and the Canadian Meat Council (CMC), comprising 105 member companies representing the $10.4 billion red-meat industry, have both signed letters of cooperation with CIPEC. Similar agreements are being pursued with other related associations. By formalizing partnerships with industry associations, the task force is not only broadening participation, but it is also able to enhance linkages with related sectors such as dairy, beverages and soft drinks. (Please note that dairy sector data is not included with the food processing sector. For specific details, see the dairy sector report.)

Monitoring and Tracking Workshops customized for the food processing industry and co-marketed by the FCPMC were held on February 9 and 10, 2000. The workshop furthers the work of the task force in bringing practical energy-management tools to sector members and addressing the challenges of consistent data tracking within the industry.

The task force is still attempting to identify an industry champion who will, among other things, raise energy efficiency awareness among food processing company executives.

In addition to industry-wide energy efficiency activities, individual members continue to invest in energy efficiency. Many companies have introduced energy-efficient boiler technologies, drying technologies, and monitoring and tracking systems. For example, Industrial Energy Innovator Maple Leaf Pork is in the process of replacing steam heat exchangers with a direct contact hot water heater. The company anticipates a minimum 25-percent reduction in fuel use per litre of water heated. Maple Leaf Pork will realize additional savings by insulating new hot water piping and the company is exploring opportunities to reduce natural gas consumption by recovering waste heat from its singers.

Nestlé Canada has introduced a comprehensive energy and environmental monitoring and targeting system. Improved tracking is helping Nestlé to identify and reduce inefficiencies, adopt best practices and uncover new savings opportunities.

Industrial Energy Innovator Maple Leaf Consumer Foods has taken action to build energy cost savings at its Winnipeg ham processing plant. Repairs to some of its power factor capacitors have enabled the plant to raise the power factor level to the 0.89–0.91 range from 0.81–0.85 before the repairs. This change has resulted in savings of $35,000 annually. The company plans to bring its power factor level up to 0.98 or 0.99 in the coming year, netting a further annual energy cost saving of $25,000.

Maple Leaf Consumer Foods has also installed a blow-down heat-recovery system and a vent condensing system from the condensate tank to recover heat, water and chemicals from the boiler continuous blow down, and return them to the steam system. This system reduces the amount of makeup water required by the boilers. The vent condensing system will save approximately $6,570 in annual energy costs with a payback of less than 120 days.

Other companies in the sector have installed energy-efficient air pressure blanket doors and air reclaimers, and have modernized equipment and facilities to help improve energy efficiency. Many food processors are moving from carbon-intensive fuels, such as oil, to natural gas.

ACHIEVEMENTS Essential baking, processing, cooling and ventilating activities make food processing an energy-intensive industry. However, energy efficiency efforts within the sector have helped to control and even reduce energy consumption. The sector's energy consumption approached 95 081 TJ in 1998, up from 85 608 TJ in 1990. Since 1990, use of electricity and steam in the food processing sector has increased, while use of heavy fuel oil has declined. In general, the industry recorded an energy-intensity improvement in 1998 of approximately 8 percent compared with 1990.

The food processing sector continues to operate under the CIPEC umbrella and to abide by industrial targets set for the sector. Data collected under CIPEC has been forwarded to Agriculture and Agri-Food Canada to support its National Climate Change Issue Table efforts, and a position paper on the

agriculture and agri-food industry has been completed. Moreover, the addition of the FCPMC and the CMC to the Food Processing Task Force will increase the profile of energy efficiency initiatives and the CIPEC program among food processing companies.

CHALLENGES The complexity and diversity of the food processing industry make it difficult to find a workable definition for the sector and to establish a single, comprehensive energy efficiency target. In general, targets set by individual sector members are in the order of 1 percent per year or more. However, developing meaningful energy consumption data will require a review and modification of the narrow boundaries established by the Standard Industrial Classification code.

To begin developing more meaningful targets, the Food Processing Task Force polled its members for their energy efficiency goals. In addition, the FCPMC will poll its members to see if their targets vary significantly from those of the task force.

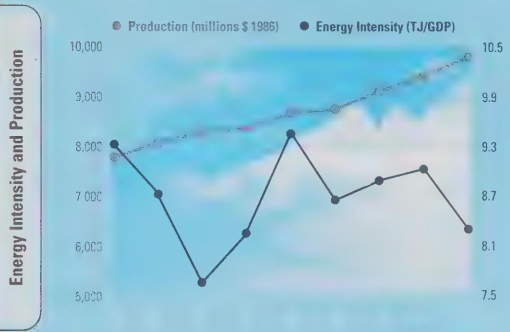
The erosion of the competitive advantage of lower energy costs historically enjoyed by the industry has boosted the urgency for sector members to capitalize on energy efficiency. Rising prices of energy sources are challenging the industry to find new ways to reduce what is a significant component of food product costs.

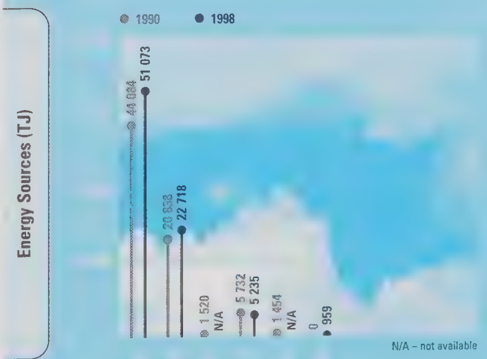
FACTS

PERFORMANCE HIGHLIGHTS

- Food processing sector members operate approximately 3 000 establishments and employ about 200 000 people across the country.
- In 1999, FCPMC and the CMC both signed letters of cooperation with CIPEC.
- Monitoring and Tracking Workshops customized for the food processing industry were held on February 9 and 10, 2000.
- A new direct contact water heater at Maple Leaf Pork will reduce fuel use per litre of water heated by a minimum of 25 percent.
- Nestlé Canada introduced a comprehensive energy and environmental monitoring and targeting system.
- Maple Leaf Consumer Foods plans investments to bring its power factor level up to 0.98 or 0.99.
- The industry recorded an energy-intensity improvement in 1998 of approximately 8 percent compared with 1990.

FIGURES





PROFILE *Ninety percent of all manufactured goods depend either directly or indirectly on the castings produced by Canada's foundry industry. There are approximately 200 foundries in Canada, employing 15 000 people and generating annual sales of $1.5 billion. About two thirds of the foundry sector's production is exported.*

FOUNDRY

ACTIONS Canada's foundries have maintained a focus on upgrading operations with energy-efficient technology as in the following examples.

- ESCO Limited has introduced a number of energy efficiency measures at its Port Coquitlam, B.C., facility. To conserve electricity, the company installed energy-efficient lighting in a number of buildings and reduced the maximum melt temperature in its furnace. To reduce natural gas consumption, ESCO eliminated its core furnace and ladle refractory lining bricks with boards. Ladles no longer need to be heated before first use and can be maintained at a much lower temperature between uses.
- Lethbridge Iron Works Company Limited has introduced a wide range of programs to improve energy efficiency. The company has installed modern, efficient, coreless induction furnaces to replace its old indirect electric arc furnaces, and has also added a new, high-efficiency heat-treatment furnace that uses modern insulation materials to conserve energy. Additional power has been saved by installing compact fluorescent lighting throughout the facility, computerized programmable logic controllers on nearly all processing equipment, and an automatic damper on compressors to turn process heat into space heat. Many space heaters have been modernized, the return sand transport system upgraded, and motors at the end of their life cycle replaced with high-efficiency models.
- Bibby-Ste-Croix has replaced two 4.7-GJ burners in its Ste-Croix, Quebec, foundry with a new three-burner system. The company modified burner placement for the new 3-GJ units to improve furnace heat distribution and achieve a substantial reduction in natural gas consumption. Installation of a casting sand-cooling drum, which enables consistent sand temperatures, lowered rejection rates while saving the company more than $250,000 per year in energy costs.

At the sector level, CIPEC is leading the development of an energy-management program for the Canadian Foundry Association. CIPEC is developing the program with the involvement of Canada Centre for Mineral and Energy Technology and the foundry industry, a positive step toward expanding the industry's involvement in CIPEC.

ACHIEVEMENTS For companies within the sector, environmental and bottom line concerns are motivating most of Canada's foundries to seek ways to improve energy efficiency and reduce GHG emissions. For example, many firms no longer use GHG-generating fuels such as coal, oil or coke in their operations and have eliminated the use of steam produced by coal-generated electricity. And many foundries are making a commitment to energy efficiency and signing up as Industrial Energy Innovators.

Both environmental and cost concerns are leading a growing number of companies to fuel switching programs and to the introduction of more energy-efficient equipment and methods. Thanks to the commitment of its members, the foundry sector plans to continue to record year-over-year improvements in its energy efficiency performance.

CHALLENGES Canada's foundries are engaged in an endless search for more energy-efficient equipment and methods driven by the continual need to remain cost and price competitive while meeting environmental standards. Recognizing that their best interests lie in meeting all applicable environmental standards as well as reducing the energy component in their products, most foundries are closely monitoring energy consumption and implementing programs to improve energy efficiency.

FACTS

PERFORMANCE HIGHLIGHTS

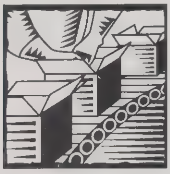
- Canada's 200 foundries employ 15 000 people and generate annual sales of $1.5 billion.
- ESCO Limited installed energy-efficient lighting in a number of buildings and reduced the maximum melt temperature in its furnace.
- Lethbridge Iron Works installed modern, efficient, coreless induction furnaces to replace its old indirect electric arc furnaces and added a new, high-efficiency heat-treatment furnace.
- Bibby-Ste-Croix replaced two 4.7-GJ burners in its Ste-Croix foundry with a new energy-saving three-burner system.
- Environmental and cost concerns are leading companies to fuel switching and to the introduction of more energy-efficient equipment and methods.

FIGURES

The sector is currently working with CIEEDAC and the OEE to develop indices and figures.

PROFILE *The general manufacturing sector comprises a variety of industries, including leather, clothing, furniture, printing, machinery, construction materials, floor coverings, imaging products, insulation, adhesives and pharmaceuticals. The sector encompasses approximately 2 000 small, medium-sized and large companies that, combined, consumed about 186 486 TJ of energy, or about 8.5 percent of the total energy consumed by all CIPEC sectors in 1998.*

GENERAL MANUFACTURING



ACTIONS To establish the fullest possible representation of the general manufacturing sector, supplementary task forces were formed in Alberta and Quebec in 1998. In addition to the national task force and these new western and eastern regional task forces, participation by related business associations and utilities has broadened the reach of energy efficiency initiatives in this eclectic sector.

Throughout 1998 and 1999, the national task force held regular quarterly meetings focused on broadening participation in CIPEC, establishing meaningful energy efficiency improvement targets, and identifying sector-specific issues, opportunities and achievements. Since the western and eastern task forces became active, they have been making significant contributions to the attainment of national representation and increased company involvement.

Other industry groups have also joined in the sector's efforts. Early in 1999, CIPEC obtained the formal support of the Canadian Association of Man Made Vitreous Fibre Manufacturers (CAMMVFM). Several companies that are active task force contributors are included in its membership. Moreover, the addition of prominent business organizations such as the Canadian Chamber of Commerce and Enbridge Consumers Gas has increased awareness of the sector's energy efficiency programs.

Aside from their collective achievements, individual task force members continue to demonstrate leadership within their own facilities and beyond. For example, through a unique partnership with a local high school, founding member Owens-Corning Canada Inc. provides ongoing support for an annual energy program at the school. Students create unique, energy-related projects, for which Owens-Corning provides recognition and prizes. Winning projects are put on display in the lobby of Owens-Corning's Scarborough, Ontario, facility.

EMCO Limited, an active participant in all three general manufacturing task forces, has undertaken several actions to reduce GHG emissions, including improvements to steam distribution, piping insulation, combustion, heat recovery, water use and compressed air distribution.

Industrial Energy Innovator and task force participant Kodak Canada Inc. has reported a steady decrease in consumption of electrical energy since 1990. In addition, the company has achieved a 13 percent reduction in total CO_2 equivalent emissions since 1990, and a 30 percent reduction of CO_2 per unit of production. Kodak will continue to track its progress through the objectives and targets it established under its recent ISO 14001 registration.

ACHIEVEMENTS In 1999, the General Manufacturing Task Force approved a 1999–2000 action plan that includes key objectives, as follows:

- achieve an energy efficiency improvement target of 1 percent per annum to the year 2010;
- increase Industrial Energy Innovator enrollment;
- broaden task force representation by establishing regional task force divisions for western and eastern Canada;
- distribute letters of support for CIPEC and Industrial Energy Innovators;
- maintain ongoing collaborative efforts with organizations including the CAMMVFM, the Canadian Chamber of Commerce, the Alliance of Manufacturers & Exporters Canada and Enbridge Consumers Gas;
- increase the involvement of other associations and firms;
- encourage energy efficiency progress reporting by the sector's Industrial Energy Innovators;
- draw attention to the success of general manufacturing companies by encouraging firms to submit success stories and case studies to CIPEC; and
- share industry ideas and information on energy efficiency opportunities and strategies.

In addition, the sector continues to focus on building increased awareness of energy efficiency issues within the industries it encompasses and is encouraging continued education among company employees and family members.

CHALLENGES Manufacturers and exporters within the industries under the general manufacturing umbrella face significant international competition. These companies must balance the time, cost and efforts needed to improve energy efficiency and meet environmental standards with the necessity to compete with countries not bound by the same constraints. Moreover, for many companies, the relatively low cost of energy reduces the economic effectiveness of major capital expenditures to improve energy efficiency.

The sector's unusual diversity also presents a challenge, making it difficult for a single task force to advance the interests of all the companies it represents. Furthermore, many manufacturers, especially smaller ones, lack the knowledge and financial resources to identify and act on energy-saving

opportunities. Despite the recognized importance of improving energy intensity, lack of staff and capital resources to dedicate to energy projects can be a significant impediment.

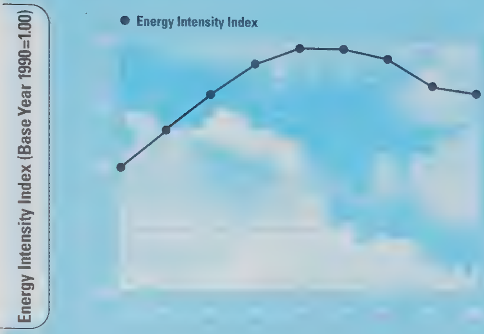
Compounding difficulties for the sector is the lack of meaningful baseline energy data. The General Manufacturing Task Force was launched in 1998 following the disbanding of a predecessor group. Because the sector's composition has changed, data used in the CIPEC annual reports before 1995/1996 is no longer applicable and cannot be compared with data in this report.

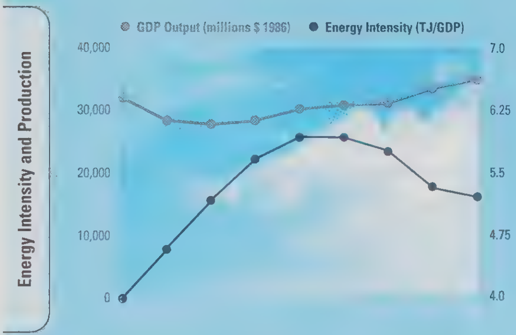
FACTS

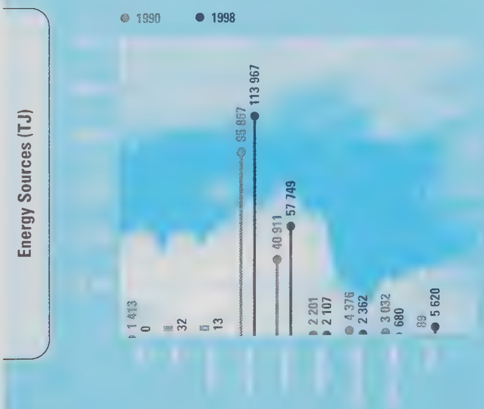
PERFORMANCE HIGHLIGHTS

- The approximately 2 000 companies included in the general manufacturing category consumed about 186 486 TJ of energy in 1998.
- To establish full national representation for the sector, supplementary task forces were created in Alberta and Quebec to cover the western and eastern regions.
- CIPEC obtained the formal support of the CAMMVFM.
- Owens Corning continues to support an annual energy program at a local school.
- EMCO Limited has made improvements to steam distribution, piping insulation, combustion, heat recovery, water use and compressed air distribution to conserve energy.
- Kodak Canada reported a steady decrease in consumption of electrical energy since 1990.

FIGURES







PROFILE *Canada's merchant lime sector supplies essential raw materials for steel production, mining, pulp and paper manufacturing, water treatment, environmental management and other basic industries. Operating 16 facilities, the sector's seven companies employed more than 650 people and had a combined lime calcining capacity of 2.28 million tonnes in 1998. From 1990 to 1997, the sector increased lime production by 25 percent, while production fell slightly by 1.3 percent from 1997 to 1998.*

LIME

ACTIONS The Canadian Lime Institute (CLI) continued to promote energy efficiency, holding its second Energy Efficiency Workshop in November 1999 to help members improve energy use in their operations. The CLI, with NRCan, published an energy conservation and efficiency guide specific to the lime sector. This publication provides general guidelines for companies seeking to use various technologies and other measures to reduce energy consumption.

Within individual companies, energy efficiency improvements have included the application of preheater technology, process automation and increased mining efficiency.

For example, Ingersoll Lime Limited recently upgraded capacitors, improving its power factor and reducing electricity use, in its Ingersoll, Ontario, facility.

Continental Lime Ltd. upgraded the crusher feeder at its Exshaw, Alberta, facility to accommodate larger haul trucks, reducing haul fuel consumption by about 40 percent. The Exshaw facility also continued to refine kiln-operating practices and installed new refractory technology to reduce energy intensity.

ACHIEVEMENTS Companies represented by the CLI are actively working to improve the energy intensity of their products. Since the 1970s the merchant lime sector has decreased its energy intensity by an estimated 29 percent. While total energy consumption increased by 635 TJ between 1990 and 1998 (as production increased by 23 percent), energy intensity decreased by 15.5 percent. In 1998, energy intensity decreased 4.2 percent from 1997 levels. The sector's energy intensity target is continuing to improve at a rate of 0.3 to 0.5 percent per year through to 2001.

GHG emissions resulting from the production of lime are offset to some extent by the reabsorption of CO_2 by lime during its life cycle. The National Lime Association estimates that more than 25 percent of lime produced in Canada and the United States reabsorbs CO_2 either in process or naturally.

CHALLENGES The production of lime occurs at very high temperatures (in excess of 1200°C), requiring combustion fuels as the principal energy source. Natural gas is the principal fuel source, with petroleum, coke and coal making up most of the balance.

The industry's heavy dependence on fuel makes energy efficiency both a top priority and major challenge. While incremental improvements continue to be made to existing manufacturing equipment, large-scale gains require substantial capital investments in new, more efficient kiln installations. However, capital turnover rates within the industry dictate the ability of lime manufacturers to make such investments.

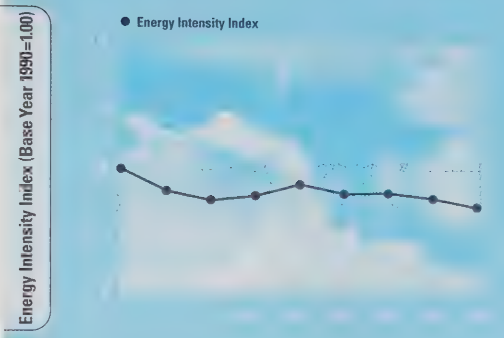
Moreover, the energy-intensity advantages of fuel switching and high-efficiency large kiln technology are undercut by the fact that these strategies may interfere with product quality, a result of paramount consideration for some of the sector's largest customers.

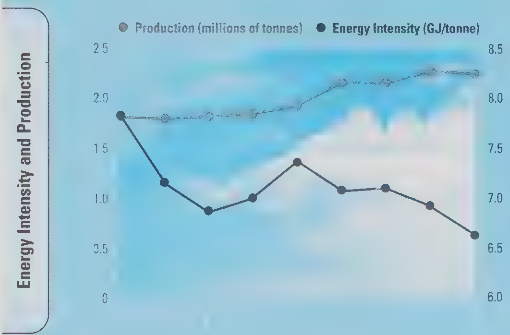
FACTS

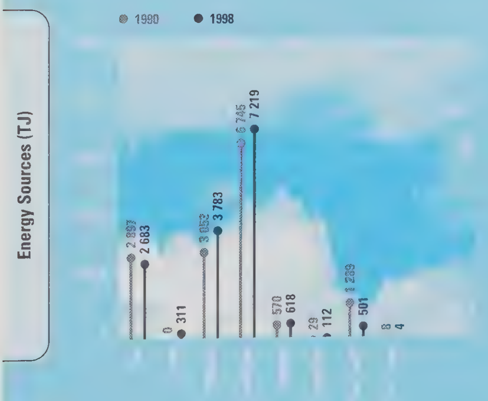
PERFORMANCE HIGHLIGHTS

- From 1990 to 1998, the lime sector increased production by 23 percent.
- CLI held its second Energy Efficiency Workshop in November 1999 to help members improve energy use in their operations.
- The CLI and NRCan published an energy conservation and efficiency guide specific to the lime sector.
- Ingersoll Lime recently upgraded capacitors to improve its power factor and reduce electricity use.
- Continental Lime upgraded its crusher feeder to accommodate larger haul trucks and reduce haul fuel consumption by about 40 percent.
- While total energy consumption increased by 635 TJ between 1990 and 1998, energy intensity decreased by 15.5 percent.
- Havelock Lime reduced fuel consumption in its shaft kiln and improved gradation.
- Companies representing 98 percent of lime production in Canada are participants in the VCR Inc.
- Chemical Lime recovered hot air from lime cooling for fuel combustion in the kiln.

FIGURES







__PROFILE__ Canada has a well-established mining industry, directly employing 367 000 people, with an annual payroll of $4.4 billion in its mining, smelting and refining activities. In 1998, the sector's output was valued at $27 billion or 4 percent of the nation's GDP. The Canadian mining sector exports roughly 80 percent of its production, valued at $45 billion or 14 percent of total domestic exports. Canada's mineral and metal exports increased by 56 percent between 1993 and 1998.

MINING

ACTIONS Members of the Mining Association of Canada (MAC) continue to improve energy efficiency, reduce production costs and contribute to Canada's overall global competitiveness.

For example, in 1998, Cominco Ltd.'s Trail, B.C., operations achieved a total GHG emission reduction of 40 percent compared with 1990. Over the same period, carbon energy consumed per tonne of metal was cut by 26 percent and CO_2 produced per tonne of metal dropped by 33 percent.

At Teck Corporation's Canadian operations, recent energy management performance improvements in materials transportation, process applications, and heating and ventilation will enable the company to stabilize emissions at 1990 levels by 2000. Teck forecasts that its total GHG emissions will decrease 8 percent below the 1990 baseline by 2000, an improvement of 21 percent despite a projected increase of 16 percent in the volume of material mined.

The Sudbury division of Falconbridge Limited completed 14 energy efficiency projects in 1998, including system and process technology modifications, and changes to operating practices. The reduction in annual energy consumption of 9 GWh represented a reduction in GHG emissions of 1.7 kilotonnes and yielded $495,000 in energy cost savings. Falconbridge's Mine Ventilation Automation Project, completed in 1999, puts in place sophisticated underground communications and control technologies. The first two phases of the project have reduced energy consumption by 25 GWh, yielding a reduction in indirect GHG emissions of 4.7 kilotonnes and producing annual savings of $1.4 million.

In addition to the actions of individual members, MAC is actively engaged in the VCR Inc., the national Office of Energy Efficiency advisory board, and several Climate Change Issue Tables. Moreover, the MAC energy task force is the first industrial sector to launch an energy managers' Internet chatline to facilitate the sharing of information and best practices, and to provide assistance in solving energy problems.

In December 1999, 13 of 30 MAC members, representing the majority of energy demand related to metal mining and non-ferrous smelting and refining, had submitted action plans to the VCR Inc. Ten members have subsequently submitted progress reports.

Also in 1999, MAC contracted two recognized environmental consultants, the Pembina Institute and Resource Futures International, to provide guidance on developing corporate strategies and action plans to help members to meet the challenges of reducing GHG emissions while also building international competitiveness.

In 2000, MAC members will host workshops on the range of options and actions to be considered for inclusion in an effective corporate climate change strategy.

ACHIEVEMENTS The metal mining industry's energy mix is heavily weighted toward electricity (43 percent), followed by heavy fuel oil and middle distillates. In 1998, total energy use in the metal mining sector was 87 965 TJ, or 3.2 percent of total Canadian industrial energy consumption. Compared with 1990, metal mining energy use was 13.3 percent lower in 1998. Total CO_2 emissions (direct and indirect) dropped 4.2 percent in 1998 compared with 1990.

In contrast, the non-metal mining industry's energy mix is heavily weighted toward natural gas (68 percent), followed by electricity (17 percent) and middle distillates (11 percent). In 1998, total energy use in the non-metal mining sector was 46 186 TJ or 1.7 percent of total Canadian industrial energy consumption. Compared with 1990, non-metal mining energy use was 10 percent higher in 1998. Total CO_2 emissions increased by 2.5 percent in 1998 compared with 1990.

The non-ferrous metal smelting and refining industry (excluding aluminum and magnesium) has an energy mix weighted toward electricity (48 percent) followed by natural gas (23 percent) and coal (14 percent). In 1998, total energy use in the non-ferrous metal smelting and refining sector was 78 284 TJ or 3.0 percent of total Canadian industrial energy consumption. Compared with 1990, the industry's energy use was 4.2 percent lower in 1998. Total CO_2 emissions dropped 8.5 percent in 1998 compared with 1990.

MAC members recognize that a credible response to climate change requires industry action and leadership. That is why MAC and its members are heavily involved in government initiatives aimed at actions and innovations that improve energy intensity and reduce GHG emissions.

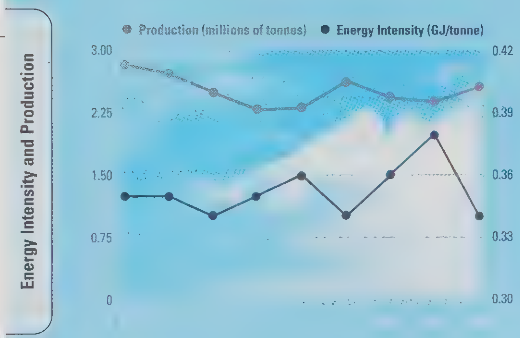
CHALLENGES A combination of fluctuating international metal prices, increased competition and rapid technological change continue to put pressures on the mining sector's capital investment programs. However, the Canadian

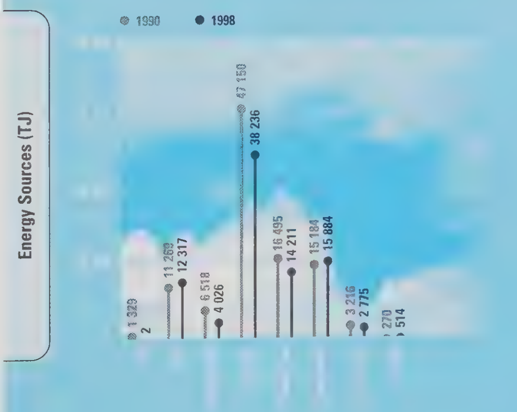
mining industry is an economic and technological leader, investing billions of dollars in capital projects and leading Canadian industry in productivity growth.

Despite improvements in energy use per unit of output and in emissions records throughout the 1990s, the mining sector will be challenged as the industry expands and energy requirements grow. And as the industry uses more energy, its GHG emissions are also projected to grow.

Energy represents between 10 and 25 percent of production costs, making energy efficiency an important part of the industry's overall competitiveness strategy. Thus, it is imperative for MAC to continue to bolster the industry's energy efficiency efforts. Members believe that, despite global economic challenges, the mining sector will continue to make substantial energy efficiency gains.

FIGURES





FACTS

PERFORMANCE HIGHLIGHTS

- In 1998, mining sector produced an estimated $27 billion in output, or 4 percent of Canada's GDP.
- Cominco's Trail operations reduced total GHG emissions by 40 percent between 1990 and 1998.
- Teck Corporation's recent energy performance improvements will enable the company to stabilize emissions at 1990 levels by 2000.
- The Sudbury division of Falconbridge completed 14 energy efficiency projects in 1998.
- The MAC Energy Task Force is the first sector to launch an energy managers' Internet chatline to provide assistance in solving energy problems.
- In 1999, MAC contracted two recognized environmental consultants to provide guidance on developing corporate climate change strategies and action plans.

PROFILE *Canada's oil sands sector includes two plants in northern Alberta and one heavy oil upgrader in Saskatchewan. Together, these facilities produce more than 350 000 barrels per day of synthetic crude oil for markets in Canada and the United States. The sector is a major employer and a significant contributor to Canada's GDP.*

OIL SANDS

ACTIONS The oil sands sector is committed to ongoing improvements in its energy efficiency and intensity through a combination of operational excellence and technological innovation. Plants are improving the reliability of their operations and introducing programs to recover waste heat and improve yields through more efficient processing. Other gains have come from the introduction of new technologies in the mining and extraction stages.

In the example of extraction plant tumblers, which use live steam to separate oil from sand, careful control of process conditions has reduced steam usage by an amount equivalent to 40 000 tonnes of CO_2 emissions per year.

New equipment has been installed to recover hydrogen from the hydrotreater purge gas streams, thereby decreasing the need for additional hydrogen production and reducing CO_2 emissions by an estimated 40 000 tonnes per year.

In 2000, a third steam turbo generator will be added to recover energy currently lost through the reduction of steam pressure through letdown valves. By using waste steam to generate electricity, power import requirements will be reduced.

An automated energy-management control system is in the design stage and will be installed in 2000. This software will be used to optimize the production of steam and power in the existing utility plant, thus minimizing energy requirements and associated costs.

Research and development, capital investment, managerial leadership and employee commitment are keys to the industry's track record of success and building blocks for future improvements.

ACHIEVEMENTS In 1998, the oil sands sector continued to improve its energy efficiency. Energy consumed per unit of production fell to 8.34 GJ/m^3, a 5.7-percent improvement compared with 1997. This compares favourably with the sector's target of a 1 percent minimum average improvement in energy efficiency per unit of production.

While total annual production rose 73 percent since 1990, energy use rose only 31.7 percent. In 1998, energy consumption totalled 172 381 TJ, 15 486 TJ below 1995 levels. Energy intensity showed a total improvement of 24 percent since 1990.

Oil sands industry members are reducing the use of coke by switching to natural gas, resulting in a significant reduction in GHG emissions.

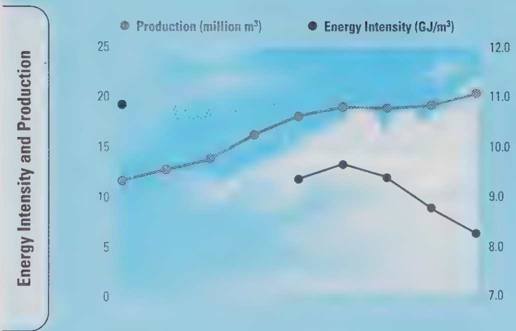
CHALLENGES Combining innovative technologies with operational excellence is key to reducing the energy consumed in oil sands production. Extraction methods that are better and less energy-intensive must be implemented and material-handling systems must be modified to more efficiently accommodate increasing production loads. However, developing and implementing improved processes, equipment and procedures is both time-consuming and expensive. The long lead times and substantial investments required to introduce enhancements have affected progress toward greater energy efficiency.

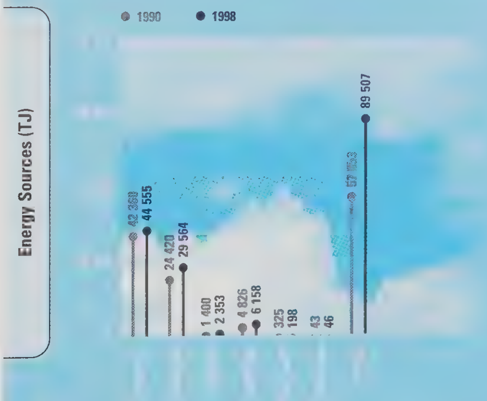
FIGURES

FACTS

PERFORMANCE HIGHLIGHTS

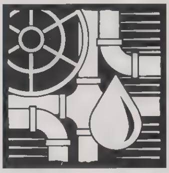
- The oil sands sector is committed to ongoing improvements in its energy efficiency and intensity through a combination of operational excellence and technological innovation.
- Careful control of process conditions has reduced steam usage by an amount equivalent to 40 000 tonnes of CO_2 emissions per year.
- New equipment has been installed to recover hydrogen from the hydrotreater purge gas streams, reducing CO_2 emissions by an estimated 40 000 tonnes per year.
- An automated energy-management control system is in the design stage and will be installed in 2000.
- In 1998, energy consumed per unit of production fell to 8.34 GJ/m³, a 5.7-percent improvement over 1997 and a total improvement of 24 percent since 1990.





PROFILE *Canada's petroleum products sector markets gasoline, diesel, heating oil, jet fuels, lubricating oil, grease, food-grade white oils, asphalts and aromatic hydrocarbons through a network of more than 15 000 wholesale and retail outlets nationwide. Operating 21 oil refineries across the country, the industry provides direct employment for 100 000 Canadians and generates an additional 250 000 indirect jobs.*

PETROLEUM PRODUCTS



ACTIONS A number of refineries invested substantial capital in improvements that enhance energy efficiency.

- Petro-Canada installed an enhanced heat-recovery system on a crude unit at one of its refineries, a move that will recover waste energy and reduce fuel use in its feed furnaces. The project, which cost $750,000, will save about 218 TJ per year in energy, reduce CO_2 emissions by 11 000 tonnes per year and net about $250,000 in savings each year.
- Imperial Oil Limited initiated a number of upgrades at its facilities, including improving the efficiency of its steam and hot water systems, installing new vacuum pumps, upgrading combustion analysers on process furnaces, and improving compressor and heat exchanger performance. Combined, these improvements have reduced the company's CO_2 emissions by more than 48 000 tonnes per year.
- Shell Canada Limited continued its focus on energy efficiency with a number of process and operational improvements, including the realignment of heat-exchanger trains, improvements to insulation and the installation of variable speed drives on air coolers. In total, the company's downstream operations realized a 70 000-tonne reduction in CO_2 emissions in 1998 and a 1.7 percent improvement in energy intensity. Combined with upstream improvements, Shell reduced its company-wide CO_2 emissions by 335 000 tonnes per year in 1998 and reached its target for 2000 two years early.
- Chevron Canada Limited installed a new waste-heat boiler and pump-around heat exchanger at its Vancouver, B.C., refinery in the last half of 1998, bringing the boiler fully online in the early part of 1999. An investment of $9 million has reduced energy consumption by close to 400 TJ per year, about 25 percent more than targeted. The project has led to an annual reduction in CO_2 emissions of approximately 20 000 tonnes and annual energy savings in purchased natural gas of about $1 million. Although capital budgets have been reduced significantly from prior years, Chevron will continue to focus on energy efficiency into 2000, including plant optimization, development of additional energy-intensity monitoring tools, furnace tuning and steam trap maintenance. Selective "debottlenecking" of crude unit heat exchangers will also be targeted through focused capital spending.

ACHIEVEMENTS Production of petroleum products grew in 1998 while the industry's energy intensity decreased. In 1998, the sector increased its production by 0.6 percent over the previous year while decreasing its energy intensity by 1.4 percent to 2.43 GJ/m^3. Compared with the 1990 base year, the sector's total energy consumption has decreased by 6.5 percent to 247 981 TJ. Between 1997 and 1998, energy consumption decreased by approximately 2000 TJ, or 0.8 percent. In 1998, the sector's energy intensity index stood at 93.3, a 1.3 percent improvement since 1997 and 17 percent better than 1990, exceeding the industry's commitment of 1 percent per year improvement.

CHALLENGES While the industry has exceeded its commitment of 1 percent annual improvement in energy intensity, pressures for increased production, driven by population and economic growth, will make ongoing improvements more challenging. Fortunately, higher capacity utilization improves refinery efficiency, thereby lowering the energy required per unit of output. In 1998, capacity utilization was 89.5 percent, compared with 89 percent in 1997.

The industry also faces increasing pressure to reduce the sulphur levels in gasoline and diesel fuels. Meeting increasingly stringent sulphur content standards requires refineries to employ more energy-intensive methods, processes that make it more difficult and expensive to reduce CO_2 emissions. Energy efficiency will be further impaired by the introduction in 1999 of lower benzene content standards for gasoline.

Economic circumstances and regional price wars for retail gasoline have drastically reduced capital budgets for refining. Thus, a new challenge lies in chasing energy efficiency in an environment where capital spending cannot be relied on.

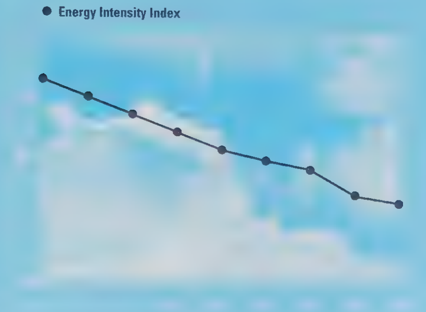
FACTS

PERFORMANCE HIGHLIGHTS

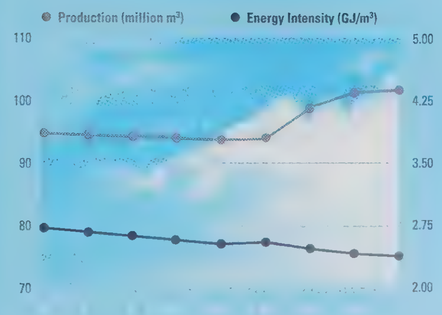
- The industry operates 21 oil refineries across the country and provides 100 000 direct jobs.
- Petro-Canada installed an enhanced heat-recovery system that will save about 218 TJ per year in energy, reduce CO_2 emissions by 11 000 tonnes per year and net about $250,000 in annual savings.
- Imperial Oil upgraded its facilities to reduce the company's CO_2 emissions by more than 48 000 tonnes per year.
- Shell Canada reduced its company-wide CO_2 emissions by 335 000 tonnes per year in 1998 and reached its target for 2000 two years early.
- Chevron's $9-million investment reduced energy consumption by close to 400 TJ per year, resulting in an annual reduction in CO_2 emissions of approximately 20 000 tonnes and annual energy savings worth about $1 million.
- In 1998, the sector's energy intensity index stood at 93.3, a 1.3-percent improvement since 1997 and 17 percent better than in 1990.

FIGURES

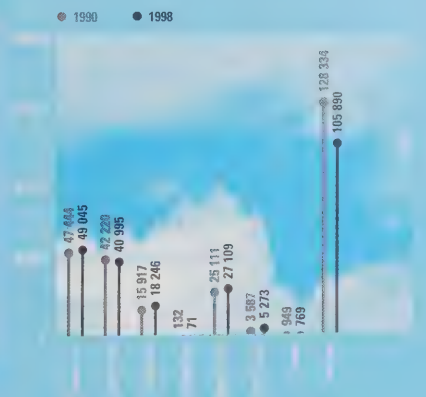
Energy Intensity Index



Energy Intensity and Production



Energy Sources (TJ)



PROFILE *Pulp and paper, a key component of the forest products industry, is a major contributor to Canada's economy. Besides pulp, the sector includes the newsprint, paperboard, building board and other paper subsectors. The pulp and paper sector's total production rose to 29.46 million tonnes in 1998.*

PULP AND PAPER

ACTIONS Pulp and paper companies continue to improve energy intensity and implement programs to switch from fossil fuels to biomass. Fuel switching, along with better use of existing equipment, adoption of energy-efficient equipment and processes, and increased use of cogeneration have enabled the industry to meet its energy efficiency goals. Some examples of successful programs are given below.

To increase hog fuel (wood residue) consumption and reduce fossil fuel use, the Pacifica Paper Inc. mill in Port Alberni, B.C., has modified its largest power boiler from stoker grate combustion to a fluidized bed configuration. This project increased hog fuel capacity for the boiler to about 800 tonnes per day, reduced fossil fuel use by 30 percent and enabled the consumption of all wood residues from various operations in the Alberni Valley.

In the fall of 1998, Spruce Falls Inc. of Kapuskasing, Ontario, commissioned three new biomass boilers equipped with emission control systems such as electrostatic precipitators and continuous emission monitoring. These boilers are designed to burn wood residue as well as waste sludge from the mill's effluent treatment plant, and will reduce the natural gas requirements for the facility from 1 703 183 million cubic feet (mcf) in 1996 to a projected 779 000 mcf once the boilers are fine-tuned. Spruce Falls has also modified its paper machine vacuum pump, shut down the thermo-mechanical pulp (TMP) reject screw press and installed a variable-speed drive on the spill basin pump of the effluent treatment plant, thereby reducing its power consumption by 9 596 MWh per year.

Stora Enso Port Hawkesbury in Nova Scotia invested $750 million in a new paper machine to replace aging facilities with a world-class alternative. The new machine produces a value-added, super-calendered grade of paper that includes up to 35 percent filler clay. Although the new furnish is provided by an energy-intensive TMP mill, 65 percent of the energy used is recovered as steam and used in the drying process. Energy consumption has dropped from 20.9 GJ per tonne of paper for paper machine #1 to 15.4 GJ per tonne for paper machines #1 and #2 combined. The company also installed a $2-million steam accumulator for boiler stabilization. This improvement reduces steam free-blowing by 75 to 80 percent during paper machine web breaks, netting an overall 4 percent reduction in paper machine steam consumption.

ACHIEVEMENTS The pulp and paper industry has improved its energy consumption per tonne of output by 10.5 percent since 1990. This achievement is consistent with the industry's commitment of a 1 percent improvement in energy efficiency per year from 1990 to 2000. The sector decreased its total energy consumption per tonne of pulp or paper from 29.5 GJ per tonne in 1990 to 26.4 GJ per tonne in 1998. Over the same period, the consumption of fossil fuel and electricity (excluding biomass) decreased from 14.2 to 12.2 GJ per tonne. The portion of total energy supplied by biomass increased from 50.5 percent in 1990 to 54.5 percent in 1998.

Thanks to an ongoing switch to biomass fuel sources, considered CO_2-neutral by the Intergovernmental Panel on Climate Change, the industry is reducing its use of less environment-friendly fossil fuel sources despite growing production. The use of biomass, including wood waste, sludge and pulping liquor, has risen by 15 percent, from 368 313 TJ in 1990 to 424 238 TJ in 1998. Over the same period, use of heavy fuel oil has been reduced by 47.3 percent. As a result, when biomass energy is excluded, it took 17.8 percent less energy to produce a tonne of pulp and paper in 1998 than it did in 1990. When biomass energy is included, the improvement is 10.5 percent.

CHALLENGES Pulp and paper has been heavily affected by recent swings in international markets. In 1998, total shipments of Canadian pulp and paper products decreased by 3.4 percent owing to a decline in sales to Asia and to the United States. This decrease, combined with an increase of 2.7 percent in world-wide manufacturing capacity, lowered the industry's overall operating rate from 91.2 percent in 1997 to 86.9 percent in 1998.

Production curtailments have led to restrictions on capital spending, creating a serious challenge for companies seeking to further improve energy efficiency and reduce GHG emissions.

Fuel switching, especially from fossil fuels to biomass fuels, promises to help the sector achieve additional reductions in energy intensity. However, the availability of wood residues such as bark, sawdust and wood shavings is limited in many areas, making transportation costs a significant barrier to greater use of residue surpluses in some parts of Canada.

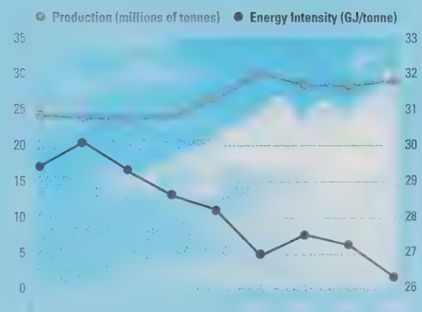
FIGURES

The sector is currently working with CIEEDAC and the OEE to develop an energy intensity index.

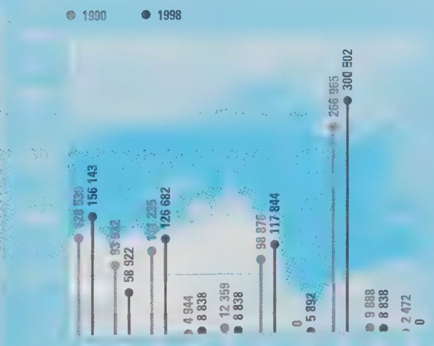
PERFORMANCE HIGHLIGHTS

- The pulp and paper sector's total production rose to 29 461 kilotonnes in 1998.
- Fuel switching, better use of existing equipment, adoption of energy-efficient equipment and processes, and the increased use of cogeneration have enabled the industry to move toward its energy efficiency goals.
- The Pacifica Paper mill in Port Alberni modified its largest power boiler, reducing fossil fuel use by 30 percent and enabling the consumption of all wood residues.
- Spruce Falls commissioned three new biomass boilers to reduce the natural gas requirements for the facility from 1 703 183 mcf in 1996 to a projected 779 000 mcf.
- Stora Enso Port Hawkesbury invested $750 million in a new paper machine to replace aging technology with a world-class alternative.
- The pulp and paper industry has improved its energy consumption per tonne of output by 10.5 percent since 1990.

Energy Intensity and Production



Energy Sources (TJ)



PROFILE *The tires, tubes, hoses, belts and other rubber products manufactured by Canada's rubber sector continue to be vital components for the automotive industry in Canada and around the world. To meet demand for its products, the rubber products industry employs just over 26 000 people in some 220 facilities nationwide, providing a total payroll of more than $650 million annually.*

RUBBER

ACTIONS As the rubber industry's national trade association, the Rubber Association of Canada (RAC) plays a crucial role in coordinating and focusing the industry's environmental efforts. A strong proponent of matching responsible care of the environment with the application of good business practices, the RAC works with local authorities on a number of fronts:

- scrap tire stewardship boards have been successfully established in every province save Ontario and Newfoundland, where the work continues;
- the RAC sponsors and mounts a biennial international symposium on rubber recycling to encourage the effective commercial development of this fragile, emerging industry;
- the RAC has established, and maintains, an industry-wide environmental tracking grid to measure the overall performance of the rubber manufacturing sector and to enable plant managers to benchmark individual plant performance against that of the industry; and
- the RAC participates in a number of federal and provincial environmental programs in addition to CIPEC, and member companies continue to utilize the Energy Efficiency Handbook jointly developed with NRCan as part of their individual energy reduction programs.

By maintaining the industry's focus on environmental issues, the RAC plays a constructive role in improving energy intensity and reducing GHG emissions.

ACHIEVEMENTS Rubber industry production rose from 600 000 tonnes in 1990 to more than 1.2 million tonnes in 1998. Total energy consumption also increased over the same period, rising from 9 115 TJ in 1990 to 11 338 TJ in 1998. Production doubled as the industry sought to supply burgeoning automotive output. The industry kept its energy use to a 24-percent increase over the same period mainly by increased capital investment in plants and machinery, as well as by an industry-wide trend to continuous seven-day operations. Both of these have had a positive impact on energy efficiency.

For the first time, the CIPEC annual report uses physical production and energy use figures from the rubber industry's own environmental tracking reports to calculate energy intensity. These figures show that the industry's energy intensity index showed marked improvement from the early 1990s through 1996, and then tended to level out from 1996 through 1998. This result reflects both the impact of the sector's long-term plan to reduce energy use and the influence of other environmental efforts such as particulate emission reduction.

According to the industry's own environmental tracking system, approximately 50 percent of the industry's energy requirements are filled by natural gas, 35 percent by electricity and nearly all of the rest by heavy fuel oil. If natural gas prices remain competitive with alternative energy sources, the industry could significantly increase its use of natural gas once Sable Island gas becomes more commercially available. One large rubber manufacturer has been unable to avail itself of natural gas energy because of its location and as a result has been more dependent on heavy fuel oils.

Despite the increase in energy consumption demanded by increased production and improved air emission quality, the rubber sector continues to improve its energy intensity record compared with the 1990 base year. However, other than the possible early availability of Sable Island gas for one large producer, there are no apparent, easily achievable improvements on the horizon. Future achievements will result from hard-won, small victories by individual manufacturers seeking to continuously reduce their energy costs.

CHALLENGES The rubber sector is made up of both large multinational companies operating efficient, modern plants and smaller, locally owned firms that, while generally efficient, do not always have the same benefit of scale available to large multinationals. While the multinationals may have the financial muscle to make ongoing investments in energy efficiency overall, all capital expenditures must still withstand close payback scrutiny from capital pool allocation committees that are generally foreign-based. Smaller firms have mixed financial abilities to undertake large energy improvement investments unless there is a clear net positive payback. Happily, this appears increasingly to be the case, and one member company has just been recognized by CIPEC for its efforts in this area.

Because of ongoing mergers and acquisitions, the majority of output tonnage increasingly derives from relatively fewer large producers. Most of the "low-hanging fruit" in this sector has already been harvested, so it will be increasingly difficult to continue to achieve present rates of energy improvement year over year.

Another, more problematic impact on energy efficiency is the continuing need to improve air emissions. Increasing public demand and government legislation for cleaner air emissions

has led the industry to undertake the installation of numerous pieces of equipment, principally electrostatic air precipitators and other process systems, in its manufacturing plants. These systems generally consume substantial amounts of energy while adding nothing to product output. Thus, improved air quality is often achieved at the cost of increased energy use.

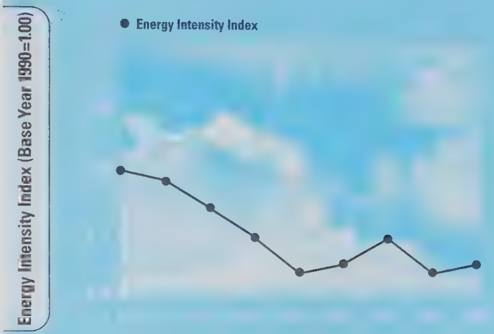
Most of the industry's production continues to be directed to the automotive industry, where suppliers are under constant pressure to improve quality and lower costs. This makes the effort to reduce energy costs an ongoing challenge. Complicating this challenge are the often conflicting demands of various federal and provincial environmental programs.

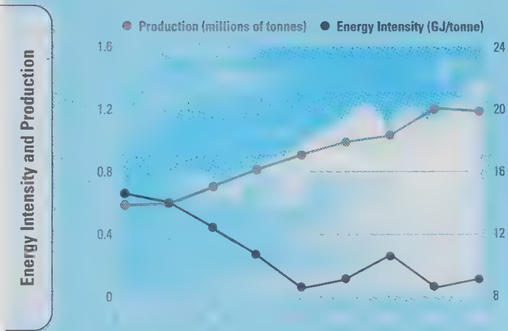
FACTS

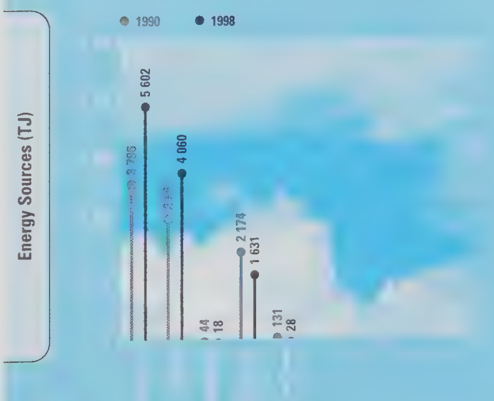
PERFORMANCE HIGHLIGHTS

- The rubber products industry employs just over 26 000 people in some 220 facilities nationwide.
- Industry production rose from 600 000 tonnes in 1990 to 1.2 million tonnes in 1998.
- Provincial scrap tire stewardship boards have been successfully established in every province except Ontario and Newfoundland.
- The RAC maintains an industry-wide environmental tracking grid to measure the sector's overall performance.
- The RAC holds a biennial international symposium on rubber recycling to encourage the effective commercial development of this emerging industry.
- Despite the increase in energy consumption demanded by increased production and improved air emission quality standards, the sector continues to improve its energy intensity.

FIGURES







PROFILE The Canadian soft drink sector consists of 110 bottling plants producing carbonated, non-alcoholic beverages, ice tea, fruit drinks and bottled water. These bottlers provide direct employment for 110 680 Canadians, with a total annual payroll of $453.2 million. Soft drink sector sales make up about one third of the $4.4 billion worth of beverages that Canadians purchase in supermarkets each year. A substantial portion of soft drink sales are also made through non-grocery channels such as hospitality establishments, drugstores, and gas, convenience and mass merchandizers.

SOFT DRINK

ACTIONS By its nature, the soft drink and bottled water industry experiences relatively low energy intensity compared with other food-related sectors. Consequently, the cost incentives that drive aggressive energy intensity reduction projects in other industrial sectors are absent. However, the industry continues to undertake efforts to achieve higher operational efficiencies, including the introduction of improvements that lead to energy intensity reductions.

Charlottetown's family-owned Seaman's Beverages is a prime example. In 1995, Pepsi bottler Seaman's installed motion-sensitive lighting throughout its production facility. Because of a shared commitment to preserving P.E.I.'s environment, company employees are kept up to date on environmental and energy issues, and have undertaken to ensure idling trucks are turned off, retreaded tires are used, and waste paper is shredded and put to use at a local animal shelter.

ACHIEVEMENTS Its broad perspective on energy consumption has led the soft drink sector to adopt alternative packaging strategies that are more environment-friendly as well as less energy-intensive. For example, soft drink makers have reduced the energy component in the packaging used to bring its products to market by turning to lighter-weight, recyclable materials such as polyethylene terephthalate (PET) plastic and aluminum. Today's PET containers are 21 percent lighter and aluminum cans are 65 percent lighter than their steel counterparts used 20 years ago. Lighter containers require less energy to produce and also reduce the transportation fuel needed to bring beverages to market. In addition, bottlers have cut the weight of packaging waste destined for landfill by 67 percent since 1988.

CHALLENGES The introduction of the North American Industry Classification System in 2000 will result in a change in the title of the sector from "Soft Drink Industry" to "Soft Drink and Ice Manufacturing." While this will mean continued data tracking at the same aggregate level, the influence of ice manufacturing on sector data will be more transparent.

Moreover, the transformation of soft drink companies into beverage companies with expanded product lines is blurring the lines between industry sectors. This process may make it difficult to clearly differentiate between data pertaining to the soft drink sector and that belonging to related sectors.

FACTS

PERFORMANCE HIGHLIGHTS

- Soft drink sector sales make up about one third of the $4.4 billion in beverages that Canadians purchase in supermarkets each year.
- The soft drink and bottled water industries experience a relatively low energy intensity compared with other food-related sectors.
- Pepsi bottler Seaman's promoted employee awareness of environmental and energy issues, enabling the company to slash waste throughout its operations.
- Soft drink makers reduced the energy component in the packaging used to bring their products to market by turning to lighter-weight, recyclable materials.
- Bottlers have cut the weight of packaging waste destined for landfill by 67 percent since 1988.

FIGURES

The sector is currently working with CIEEDAC and the OEE to develop indices and figures.

__PROFILE__ Canada's steel sector is one of the country's largest industries, generating sales of more than $11 billion and $3.6 billion in exports in 1998. The industry includes 18 plants that directly employ 33 500 workers. The companies that make up the steel sector supply flat-rolled (sheet and plate), long (re-bar and structural steel), and specialty and alloy (stainless and tool steels) products for major markets, including transportation, oil and gas, appliances, packaging and construction. While facilities are found in six provinces, Ontario accounts for 70 percent of Canadian steel production.

STEEL

ACTIONS Canadian steel makers continued to emphasize energy efficiency as a major thrust of productivity, quality and cost-reduction efforts in 1998 and 1999.

- Ivaco Rolling Mills Inc. recently installed a new natural-gas-fired reheat furnace equipped with high-efficiency burners and recuperators to preheat combustion air.
- Stelco McMaster Ltée improved its energy efficiency by installing a high-impedance transformer and using an oxygen lance at the eccentric bottom-tapping steel-making furnace, and by adopting electromagnetic stirring in the continuous casting process.
- At Dofasco Inc., electric motors are now tested in-house, allowing earlier detection of faulty or off-spec performance, and saving electricity.
- Lake Erie Steel Company continues to offset coke use in its blast furnaces by adding natural gas. The company plans to upgrade its boilers to capture more of the resulting blast furnace gas energy as steam that can be used to produce electricity.
- Stelco's Hilton Works will install a Level II furnace control system to reduce energy consumption by 10 percent on its plate mill furnaces.
- At Gerdau Courtice Steel Inc., recovery of landfill gas, begun in 1998, has offset purchases of natural gas.
- Stelfil Ltée, Dofasco, Slater Steel Inc. and Lake Erie Steel Company are among the Canadian steel companies that will promote awareness of energy efficiency and climate change among employees over the next year.

ACHIEVEMENTS The Canadian steel industry registered strong performance in shipments, sales and exports in 1998, though all of these were down from record levels in 1997. In 1998, the industry produced 15.8 million tonnes of steel and shipped 14.1 million tonnes.

Since 1990, the industry has achieved a 15-percent improvement in energy consumed per tonne shipped. This results from a 6-percent reduction in total energy consumed and a 12-percent increase in shipments. The average annual energy efficiency improvement was 1.9 percent, surpassing the industry's commitment of 1 percent per year to 2000 from the adjusted 1990 rate of 21.18 GJ per tonne shipped. In addition to these factors, a 21 percent less carbon-intensive energy mix has led to a 12-percent reduction in total CO_2 emissions.

The industry has sought a "90/90" member commitment to voluntary energy efficiency improvement. With Ispat-Sidbec Inc. joining the Eco-geste program in Quebec, 91 percent of companies representing 92 percent of production are now involved.

In the latter part of 1999, the Canadian steel industry renewed its voluntary energy efficiency commitment. Between 2000 and 2010 the Canadian steel industry will improve energy intensity by an average 1 percent per year compared with a 2000 base year. If the new target is achieved, the sector will register an equivalent improvement in energy consumption per tonne shipped of 1.6 percent per year over the 20-year period from 1990.

Individual companies have also recorded significant recent achievements. Dofasco and Stelco are part of a world-wide consortium that has developed the ultralight steel auto body (ULSAB). ULSAB weighs up to 35 percent less than comparative auto bodies and is more fuel-efficient, stronger, safer and cheaper. On behalf of the project, the two companies were awarded the Transportation: Technology Award at Canada's Energy Efficiency Conference in May 1999.

Co-Steel Lasco installed the Expert Furnace System Optimization Process (EFSOP™), a novel computerized system that optimizes combustion and operations, in its electric arc furnace operation. Capturing some of the energy lost through incomplete combustion resulted in total annual savings of $1 million. Dr. Howard Goodfellow of Stantec Global Technologies Ltd., who designed the system, won the Industry: Process – Tier II Award at Canada's Energy Efficiency Conference in May 1999.

CHALLENGES Most customers of the steel industry are under intense competitive pressure to deliver more value to their own customers and this pressure is transferred back up the supply chain.

To hold onto their customers, attract investment capital and sustain well-paid jobs, individual steel makers must improve productivity in step with, or ahead of, their competitors. They must reduce costs while still delivering higher-value products to their customers.

The steel industry has responded to these challenges with innovation, new technology and substantial capital investments. As a result, the industry now uses less energy per tonne than it did in the early 1980s, producing superior products at significantly lower prices. Despite these successes, maintaining and improving productivity remains an ever-present challenge for the industry.

Trends in international trade also present a significant challenge to Canadian steel makers. Since Canada's principal steel trading relationship is with the United States, Canadian producers must compete with U.S. producers. However, offshore imports into both Canada and the United States rose dramatically in 1998 and continued into 1999. This trend reflected the effect of the Asian financial crisis and the Russian economic collapse on exporting nations, as developing nations strove for foreign markets for their growing production.

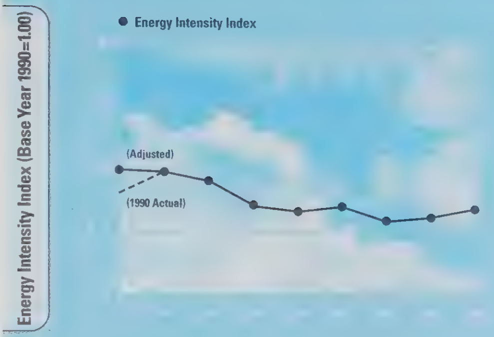
The Canadian steel industry supports liberalized trade and open markets on a level international playing field. However, with many international suppliers based in low-wage countries not covered by the Kyoto Protocol and with emerging countries maintaining government-supported excess capacity, it is a challenge to ensure effective tools are in place to prevent unfairly traded imports.

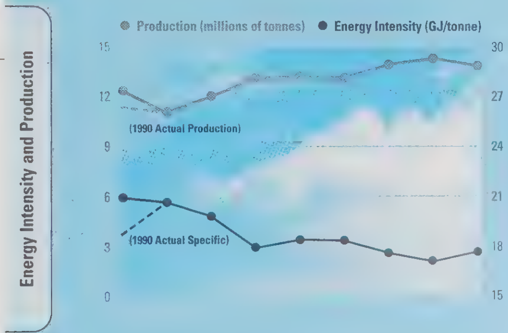
FACTS

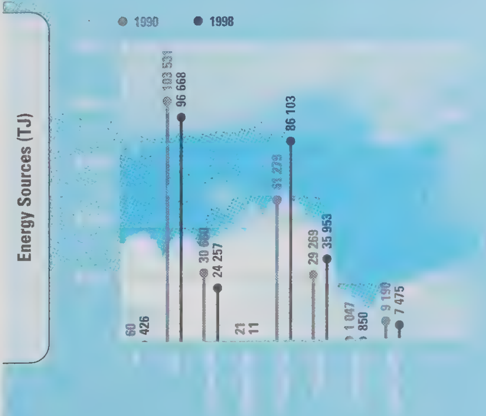
PERFORMANCE HIGHLIGHTS

- The steel industry includes 18 plants that melt and pour steel, directly employing 33 500 workers.
- The industry registered strong performance in shipments, sales and exports in 1998.
- Since 1990, the industry has achieved a 15-percent improvement in energy consumed per tonne shipped.
- The sector's average annual energy efficiency improvement is 1.9 percent, surpassing the industry's commitment of 1 percent per year.
- Dofasco and Stelco received the Transportation: Technology Award for their role in developing the light-weight, strong ULSAB.
- The industry now uses less energy per tonne than it did in the early 1980s so it can produce superior products at significantly lower prices.

FIGURES







PROFILE Canada's textile sector produces the fibres, yarns and fabrics used in industries as diverse as agriculture, automotive manufacturing, clothing, construction, environmental protection and road construction. The textile sector is organized into three subgroups: primary textiles, textile products and motor vehicle fabric accessories. Together, the industry sells to 150 markets and exports close to 30 percent of its production.

TEXTILES

ACTIONS A number of companies have added their names to the textile sector's list of Industrial Energy Innovators in 1999, including Barrday, Inc., Cambridge, Ontario; C.S. Brooks Canada Inc., Magog, Quebec; DIFCO Performance Fabrics Inc., Montréal, Quebec; Stedfast Inc., Granby, Quebec; and Swift Denim, Drummondville, Quebec.

Throughout the sector, companies are benefiting from more efficient uses of energy.

- Electricity use per unit of output in 1998 at Fabrene Inc. of North Bay, Ontario, was 73 percent of 1990 levels and exceeded the firm's energy efficiency target for the year.
- Consoltex Group Inc. committed to a 5-percent annual reduction of energy consumption per unit of output at its five Canadian manufacturing facilities.
- Energy use per unit of output for all of DuPont Canada Inc.'s manufacturing facilities was 19.6 percent below 1990 levels.
- Two companies installed "solar walls" in their facilities to recover energy from the building and from the sun, thereby reducing the use of natural gas and electricity. Other companies are installing energy-efficient lighting and motors, using heat reclaimer units and air leak monitoring systems, and upgrading steam trap monitoring systems.

In 1999, the Textile Energy Task Force confirmed the comprehensive action plan introduced in 1997 and agreed to concentrate on two principal goals: to broaden the participation of textile manufacturers in Industrial Energy Innovators and the VCR Inc., and to strengthen the commitment of existing Energy Innovators. Manufacturers participating in the task force have agreed to demonstrate by example the economic benefits that flow from effective energy efficiency programs. Moreover, task force members remain committed to follow up directly and personally with the sector's Industrial Energy Innovators to review their progress in fulfilling their commitments.

The industry is continuing its own survey to identify and correct inconsistencies and errors in the textile industry data currently available in government reports. More accurate information will enable the industry to establish better measures of success in meeting energy efficiency targets. In addition to the industry's own data-gathering activities, the Canadian Textiles Institute is providing a third year of financial support to CIEEDAC at Simon Fraser University.

ACHIEVEMENTS The textile sector's energy mix has been shifting away from hydrocarbon sources to electricity. Natural gas use has declined from 64 percent of total energy consumption in 1990 to just under 49 percent in 1998. Consumption of other hydrocarbon fuels declined from 8 percent in 1990 to just under 6 percent in 1998, while electricity's share rose from 28 percent in 1990 to more than 36 percent in 1998.

As a result of the industry's efforts to improve the accuracy of reporting by individual companies, Statistics Canada's 1998 data more accurately reflects the industry's experience. Although sales remained at constant levels, total energy consumption as reported by Statistics Canada declined from 25 778 TJ in 1997 to 24 296 TJ in 1998. The industry's GDP output in 1998 was 21.5 percent higher than in 1990, while its energy consumption increased by only 12.1 percent.

In August 1999, the Textile Energy Task Force committed the industry to a new energy intensity target of 1 percent per year for the period 2000–2010. Efforts will build on energy efficiency performance since 1995 and reflect ongoing consultations to meet Canada's Kyoto commitments.

CHALLENGES The task force believes that a key challenge is to gain the active involvement of more of the industry's major producers as Industrial Energy Innovators. Its members continue to lead in efforts to broaden participation.

In addition to developing methods to measure energy use more accurately, increased efforts are required to sensitize those in the textile industry to the long-term implications of Canada's Kyoto commitments and to encourage active participation in the new national implementation strategy for energy efficiency.

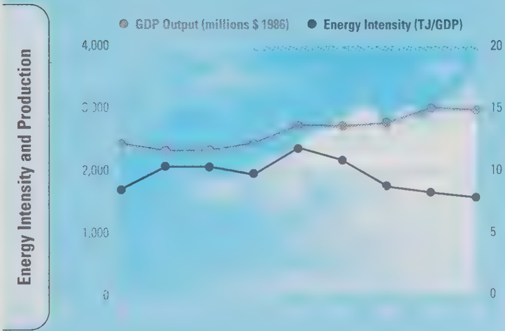
During 1999, the Textile Energy Task Force and the Canadian Textiles Institute have devoted time and resources to addressing these challenges; their efforts need to continue and be intensified.

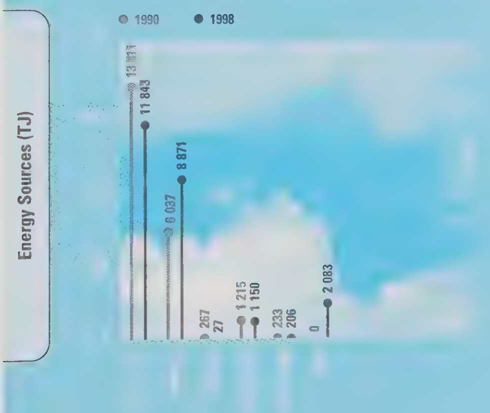
FIGURES

FACTS

PERFORMANCE HIGHLIGHTS

- Canada's textile industry sells to 150 markets and exports close to 30 percent of its production.
- Electricity use per unit of output in 1998 at Fabrene of North Bay was 73 percent of 1990 levels.
- Consoltex committed to a 5-percent annual reduction in energy consumption per unit of output at its five Canadian manufacturing facilities.
- Energy use per unit of output for all of DuPont Canada's manufacturing facilities was 19.6 percent below 1990 levels.
- The sector's energy mix shifted away from hydrocarbon sources to electricity between 1990 and 1998.
- In 1998 the industry's GDP output was 21.5 percent higher than in 1990 while its energy consumption increased by only 12.1 percent.





PROFILE The Canadian transportation equipment manufacturing sector includes companies manufacturing aircraft, aircraft parts, automobiles, motor vehicle parts, trucks, buses, trailers and military vehicles, as well as railroad rolling stock, ships and pleasure boats. The sector is a major part of the Canadian economy, accounting for nearly 3 percent of Canada's GDP and more than 15 percent of the total manufacturing GDP in 1998. Including dealer, parts and distribution networks, the sector employs more than half a million people across Canada.

TRANSPORTATION MANUFACTURING

ACTIONS The CIPEC Transportation Equipment Manufacturing Task Force continued a tradition of promoting energy efficiency at its third annual one-day energy conference held in April. The conference included the presentation of success stories, climate change and CIPEC/VCR updates, and tours of DaimlerChrysler Canada Inc.'s Windsor, Ontario, assembly plant and the 70-MW TransAlta Windsor-Essex cogeneration facility that supplies steam to the plant.

In May of 1998, a live interactive satellite teleconference on efficient electrical motor systems was held at Ford Motor Company of Canada, Limited, in Oakville, Ontario. The teleconference included a demonstration of Ford's power monitoring system and case studies from across the United States.

The task force continues to encourage auto parts suppliers to join the Industrial Energy Innovators program and submit action plans to the VCR Inc. Task force members also assisted the sector's working group on the National Climate Change Industry Table in formulating foundation and technology assessment reports for the sector. In addition, the task force seeks to expand the sector's coverage to include rail and marine manufacturers along with support from natural gas and electrical utilities. The industry is currently planning an energy conference for the second half of 2000.

The past year evidenced a number of individual energy efficiency success stories, including the following.

- General Motors of Canada Limited implemented energy efficiency projects that resulted in savings of more than $3 million annually in heating and ventilation, process improvement, compressed air, high-efficiency lighting and energy management. A lighting retrofit project at its Oshawa, Ontario, body plant reduced energy use by 46 percent while providing better lighting levels.
- Ford's Essex Engine Plant upgraded its centrifugal air compressors by installing microprocessors that eliminate air leaks and match compressor output to plant demand. This upgrade has led to savings of $200,000 per year in reduced power consumption.
- DaimlerChrysler's Etobicoke, Ontario, aluminum casting plant has replaced three aluminum melt furnaces with new high-efficiency units. The units more than double energy efficiency to 42 percent from 20 percent for the old furnaces and have yielded annual savings of more than 39 000 GJ and $168,000.

ACHIEVEMENTS A robust economy and major capital projects contributed to a 3-percent increase in the sector's total energy consumption in 1998. However, energy intensity has decreased to the lowest level in the 1990s and is nearly 4 percent below the 1990 level.

In 1998, the sector consumed 68 633 TJ of energy, up 30.5 percent since 1990. Over the same period, the gross output increased by 35.3 percent, for an overall improvement in energy intensity of 3.6 percent over 1990 levels. The total energy used by the sector is 2.8 percent of the total of all industries in Canada. Within the sector, the largest energy users are the motor vehicle assembly and automotive parts, which account for 41 percent and 38 percent respectively.

Over the long term, the sector expects overall growth averaging 2 percent per year. While motor vehicle manufacturing will grow at a relatively modest pace reflecting the mature state of the North American automotive market, Canadian production of automotive parts should grow at a considerably faster pace. This reflects lower labour costs and other trends that increasingly favour the Canadian sourcing of automotive parts.

Energy use by fuel type has remained fairly constant since 1990 with natural gas (55.3 percent) and electricity (35.6 percent) making up the bulk of the energy used. Surprisingly, use of liquid petroleum gases and middle distillates (#2 fuel oil) has increased by 216 percent and 130 percent respectively since 1990. With higher natural gas prices anticipated, this trend may well continue. On the other hand, heavy fuel oil and coal use has continued to decline since 1990.

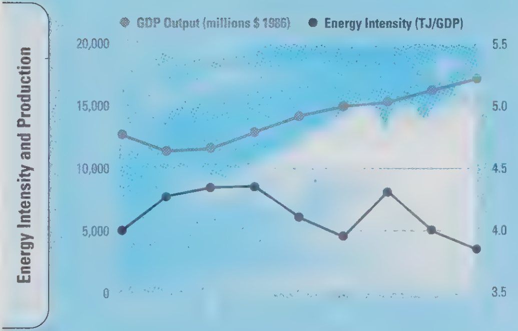
CHALLENGES The transportation manufacturing sector is committed to continuously improving quality, environmental performance and energy efficiency. Energy-efficient equipment is being installed wherever feasible, but investment payback requirements of less than two years and internal competition for funds are challenging energy managers seeking to make major gains. Moreover, energy efficiency gains arising from the implementation of new technology will likely be offset by trends driving energy use higher. These trends include the increased use of cooling to improve working conditions, higher pollution control standards, and shifts to more energy-intensive products and processes.

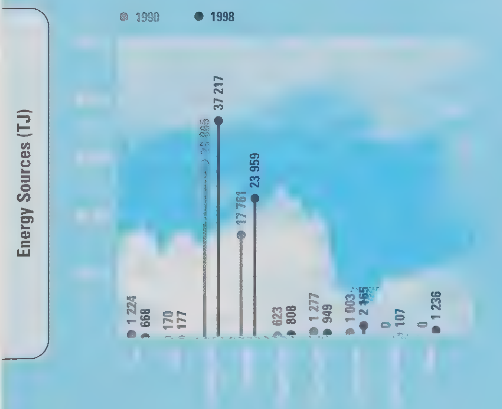
Unless there are major breakthroughs in technology, energy efficiency improvements in the sector are likely to come in small increments. Moreover, since the sector is already an efficient energy user, there are relatively few cost-effective opportunities

for dramatic gains. Cogeneration represents the single biggest opportunity for energy efficiency improvement, but not all industry facilities are suited to its use.

The sector continues to take strong action to reduce GHG emissions. The 1990 base year was a low production year for the sector. Since then, economic recovery combined with industry growth has caused emissions to increase by 35 percent despite the sector's best efforts. It will be extraordinarily difficult for the sector to meet a sector-specific target that parallels Canada's overall Kyoto commitment to reduce overall emissions by 6 percent below 1990 levels.

FIGURES





FACTS

PERFORMANCE HIGHLIGHTS

- The transportation manufacturing sector accounted for nearly 3 percent of Canada's GDP and more than 15 percent of the total manufacturing GDP in 1998.
- Energy intensity dropped to its lowest level so far in the 1990s, nearly 4 percent below the 1990 level.
- General Motors of Canada implemented energy efficiency projects that led to savings of more than $3 million annually.
- Ford of Canada's Essex Engine Plant reduced its annual power consumption for savings of $200,000 per year.
- New furnaces at DaimlerChrysler's Etobicoke aluminum casting plant yielded annual savings exceeding 39 000 GJ and $168,000.
- The sector's task force will seek to expand its coverage to include rail and marine manufacturers along with support from natural gas and electrical utilities.

PROFILE *The wood products industry consists of nearly 3 000 establishments across Canada employing just under 20 000 workers. The sector includes sawmills, planing mills and shingle mills that manufacture products ranging from timber to finished lumber for domestic and world markets. The sector's consumption of 69 243 TJ of fossil fuels and electricity in 1998 was down from the 1997 figure of 70 931 TJ, but up from 37 356 TJ in the 1990 base year.*

WOOD PRODUCTS

ACTIONS A Canadian wood-fibre products manufacturing company developed an ultra-filtration system that reduces the amount of waste-water and suspended solids produced by plant processes. A $300,000 investment had a one-year payback at one facility; at another, recovering chemicals saved $750,000. The system is two to three times more energy-efficient than conventional biological treatments.

On August 16, 1999, Industrial Energy Innovator Tembec Inc. announced that its affiliate Spruce Falls Inc. (also an Industrial Energy Innovator), achieved ISO 14001 certification for its newsmill, woodlands and sawmill operations. Spruce Falls produces 378 000 tonnes of newsprint and specialty papers and more than 120 million board-feet of lumber each year. The drying kiln for this lumber is heated by steam from the reboiler at the TMP plant in the adjacent pulp mill. Recovered steam is also used for drying paper at the pulp plant. Spruce Falls is the first wood products company in Ontario to be certified to the ISO 14001 environmental standard for woodlands and sawmill operations.

Forintek Canada Corp., Canada's applied research institute for the solid wood products industry, is a non-profit partnership of more than 150 manufacturing companies, the Canadian Forest Service and the provinces of British Columbia, Alberta, Quebec, New Brunswick and Nova Scotia. Forintek has developed OASiS, a computer-based program that simulates a variety of wood pre-sorting strategies, and KD Expert, a training tool for kiln operators and supervisors. Current research at Forintek includes a lumber-drying program that aims to improve the quality of kiln-dried lumber and reduce drying time and energy costs. One objective of the program is to develop an adaptive kiln controller capable of continually adjusting drying parameters to conditions inside the kiln.

Flakeboard Company Limited has completed a $30-million project to double production and make its St. Stephen, New Brunswick, facility one of the largest producers of thin, high-density fibreboard in North America. The project enables Flakeboard to produce 600 million square feet of 3-mm board annually. Raw material for this increased capacity will come entirely from wood waste from local sawmills. A $10-million storage facility created by the project incorporates a new programmable logic control system to sort and control incoming wood residue. The new system virtually eliminates both raw material losses and problems resulting from open-air storage, at the same time reducing drying time and energy costs.

ACHIEVEMENTS Individual companies in the wood products sector continue to implement low-cost energy efficiency measures. Fuel switching to biomass energy sources remains a major industry focus as companies seek to reduce production costs and improve their energy efficiency.

However, production and, consequently, energy efficiency efforts continue to be impaired by adverse national and international economic factors. These factors have forced companies to increase their focus on marketing and product improvement, often involving greater energy consumption for such measures as kiln drying.

To encourage and educate the sector in energy efficiency matters, the task force developed the publication, *Energy Efficiency Opportunities in the Solid Wood Industries*, still being distributed to individual companies.

CHALLENGES Establishing meaningful data for the wood products sector is complicated task. The breadth of products produced by the sector (everything from low energy intensity shingles to energy-intensive structural products such as new, high-tech oriented strand boards) makes it difficult to develop meaningful comparisons. Moreover, many energy efficiency efforts in this sector, such as wood waste cogeneration, are integrated with the pulp and paper sector, making it difficult to isolate and apply beneficial impacts to the energy profile of this sector.

Before 1995, the sector's wood waste for energy use had been attributed to the closely allied pulp and paper industry. In 1995, energy data collection was refined to differentiate the wood waste used by each sector. While this has resulted in more accurate data for each sector, it has made 1990 energy consumption numbers an inappropriate base.

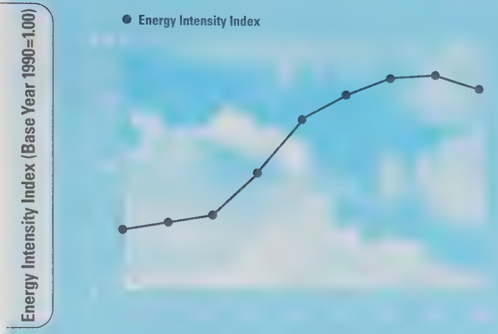
Refinements in energy data collection have increased the ability to track the use not only of purchased energy, but also of internally generated energy, improving the knowledge of energy use by the wood products and other industrial sectors.

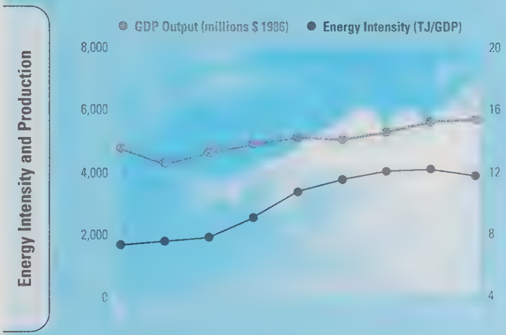
FACTS

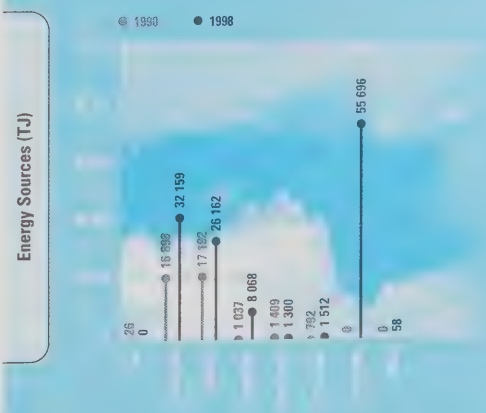
PERFORMANCE HIGHLIGHTS

- The wood product sector consumed 69 243 TJ of fossil fuels and electricity in 1998, down from 70 931 TJ in 1997.
- A Canadian wood-fibre products manufacturing company developed an ultra-filtration system that reduces the amount of wastewater and suspended solids produced by plant processes.
- Current research at Forintek includes a lumber-drying program that aims to improve the quality of kiln-dried lumber and reduce drying time and energy costs.
- Spruce Falls became the first wood products company in Ontario to be certified to the ISO 14001 environmental standard for woodlands and sawmill operations.
- A new production system at Flakeboard virtually eliminates both raw material losses and problems resulting from open-air storage, and reduces drying time and energy costs.
- Fuel switching to biomass energy sources remains a major industry focus as companies seek to reduce production costs and improve their energy efficiency.

FIGURES







INNOVATORS

by sector

Through NRCan's Office of Energy Efficiency, the Industrial Energy Innovators Initiative focuses on transforming the sector-level commitments made by the task forces into company-level action by helping to overcome obstacles to energy efficiency at the company level.

As of April 1, 2000, 254 manufacturing and mining companies representing more than 75 percent of industrial energy use have signed on as Industrial Energy Innovators. The majority of these companies are participants in the VCR Inc.

For information on becoming an Industrial Energy Innovator, contact the Office of Energy Efficiency at cipec.peeic@nrcan.gc.ca.

Aluminum

Alcan Smelters and Chemicals Ltd.
Aluminerie Alouette inc.
Aluminerie de Bécancour inc.
Aluminerie Lauralco inc.
Société Canadienne de Métaux Reynolds, Limitée

Cement

Blue Circle Canada Inc.
ESSROC Canada Inc.
Inland Cement Limited
Lafarge Canada Inc.
North Star Cement Limited
St. Lawrence Cement Inc.
Tilbury Cement Limited

Chemicals

Chinook Group – Sombra Plant
DuPont Canada Inc.
Elementis Pigments Canada
MDS Nordion Inc.
Nacan Products Limited
NOVA Chemicals Corporation
OxyVinyls Canada Inc.
Synergistics Industries Limited

Electrical/Electronics

ASCOLECTRIC Ltd.
Broan Limited
Honeywell Limited
IBM Canada Ltd.
Nortel (Northern Telecom Limited)
Osram Sylvania Ltd.
Vansco Electronics Ltd.

Food and Beverage

Andrés Wines Ltd.
Casco Inc.
Coca-Cola Beverages Ltd.
Cuddy Food Products
Garden Province Meats Inc.
H.J. Heinz Company of Canada Ltd.
Hub Meat Packers Ltd. – Sunrise Brand
Kraft Canada Inc.
Labatt Breweries of Canada
Maple Leaf Meats
Maple Leaf Pork
Maple Lodge Farms Ltd.
Molson Breweries
Moosehead Breweries Ltd.
Pepsi-Cola Canada Beverages
Sleeman Brewing and Malting Co. Ltd.
Sun-Rype Products Ltd.
Versacold Corporation

General Manufacturing

3M Canada Inc.
ABCO Property Management Inc.
Canadian Uniform Limited
Champion Feed Services Ltd.
Coyle & Greer Awards Canada Ltd.
Crown Cork & Seal Canada Inc.
Degussa-Huls Canada Inc.
EMCO Building Products – A Division of EMCO Limited
Envirogard Products Ltd.
Escalator Handrail Company Inc.
Euclid-Hitachi Heavy Equipment Ltd.
Federated Co-operatives Limited
Ferraz Shawmut Canada Inc.
Fibrex Insulations, Inc.
Garland Commercial Ranges Limited
Greif Containers Inc.
Imperial Home Decor Group Canada Inc.
Imperial Tobacco Limited
International Paper Industries Limited
Jones Packaging Inc.
Kindred Industries
Kodak Canada Inc.
LePage (Division of Henkel Canada Limited)
Maksteel Service Center (Division of Makago Industries Ltd.)
Marcel Lauzon Inc.
Metroland Printing, Publishing & Distributing Ltd.
Owens-Corning Canada Inc.
Polytainers Inc.
PRO-ECO Limited
Regent Eco Canada
Rohm and Haas Canada Inc.
Sandvik Tamrock Canada
Scapa Tapes North America
S.C. Johnsons & Sons, Limited (Johnson Wax)
Simmons Canada Inc.
Soprema Inc.
Starcan Corporation
Superior Radiant Products Ltd.
Tamrock Loaders Inc.
Teknion Furniture Systems
The Source Medical
VicWest Steel
Viskase Canada Inc.
Wabash Alloys Ontario
Wescast Industries Inc.
Wyeth-Ayerst Canada Inc.

Lime

Beachville Lime Limited
Chemical Lime Company of Canada Inc.
Continental Lime Ltd.
Dundas Lime Limited
Graybec Calcium Inc.
Havelock Lime (Division of Goldcorp. Inc.)
Ingersoll Lime Limited
Northern Lime Limited

Mining

Aur Resources Inc.
Barrick Gold Corporation – La Mine Doyon
Battle Mountain Canada Ltd., Golden Giant Mine
BHP Diamonds Inc.
Boliden Limited
Brunswick Mining Division
(Brunswick Mining and Smelting Corporation Limited)
Brunswick Smelting and Fertilizer Division
(Brunswick Mining and Smelting Corporation Limited)
Cominco Ltd.
Echo Bay Mines Ltd. – Lupin Operation
Falconbridge Limited
Fonderie Horne – Métallurgie Noranda inc.
Hillsborough Resources Limited
Hudson Bay Mining & Smelting Co., Ltd.
INCO Limited
International Minerals and Chemicals (Canada) Global Limited
(IMC Kalium Canada Ltd.)
Iron Ore Company of Canada
Mines et exploration Noranda inc. – Division Matagami
Mines Wabush (gérées par la Compagnie Minière Cliffs inc.)
Noranda Metallurgy Inc. (Canadian Copper Refinery)
Placer Dome Canada Limited
Quebec Cartier Mining Company
Syncrude Canada Ltd.
Teck Corporation
Zinc Électrolytique du Canada Limitée/Canadian Electrolytic
Zinc Limited

Petroleum Products

Amoco Canada Petroleum Company Limited
Canadian Tire Petroleum
Chevron Canada Limited – Burnaby Refinery
Enbridge Pipelines Inc.
Husky Oil Operations Ltd.

Imperial Oil Limited
Interprovincial Pipe Line Inc.
Irving Oil Limited
Nova Corporation
Parkland Refining Ltd.
Petro-Canada
Safety-Kleen
Shell Canada Products Limited
Suncor Energy Inc. – Sunoco Group
Ultramar Ltd. – Saint-Romuald Refinery

Plastics

Downeast Plastics Ltd.
Husky Injection Molding Systems Ltd.

Potash

Potash Corporation of Saskatchewan Inc.
– Allan Division
– Cory Division
– Lanigan Division
– New Brunswick Division
– Patience Lake Division
– Rocanville Division

Pulp and Paper/Forestry

Abitibi-Consolidated Inc.
Avenor Inc.
Canfor Corporation
Cariboo Pulp and Paper Company Limited
Daishowa Inc.
Donohue Inc. (QUNO Inc.)
E.B. Eddy Forest Products Ltd.
Eurocan Pulp and Paper Company Limited
F.F. Soucy Inc.
Fletcher Challenge Canada Ltd.
Fort James-Marathon, Ltd.
James Maclaren Industries Inc.
Kruger Inc.
Lake Utopia Paper
MacMillan Bloedel Limited
Maritime Paper Products Limited
Nexfor Inc.
Paperboard Industries International Inc.
(Division of Cascades Inc.)
Repap Enterprises International Inc.
Riverside Forest Products Limited, Armstrong Division
Spruce Falls Inc.
St. Marys Paper Ltd.
Stora Enso Port Hawkesbury Limited
Tembec Inc.
Weldwood of Canada Limited
West Fraser Timber Co. Ltd.
Weyerhaeuser Canada Ltd.

Rubber

Gates Canada Inc.
Michelin North America (Canada) Inc.
NRI Industries Inc.

Steel

Algoma Steel Inc.
AltaSteel Ltd.
Atlas Specialty Steels – A division of Atlas Steel Inc.
CHT Steel Company
Co-Steel LASCO
Dofasco Inc.
Frost Wire Products Ltd.
Gerdau Courtice Steel Inc.
Hilton Works
Ivaco Inc. (Ivaco Rolling Mills)
Lake Erie Steel Company Ltd.
Laurel Steel (Division of Harris Steel Limited)
QIT – Fer et Titane Inc.
Slater Steels Inc. – HSB Division
Stelco Fasteners Ltd.
Stelco Inc.
Stelco-McMaster Ltée
Stelfil Ltée
Stelpipe Ltd.
Stelwire Ltd.
Sydney Steel Corporation
Welland Pipe Ltd.

Textiles

Agmont Inc.
Albarrie Canada Limited
Barrday Inc.
Beaulieu Canada Inc.
Britex Group (The)
Cambridge Towel Corporation (The)
Canada Cordage Inc.
Canada Hair Cloth Company Limited
Cavalier Textiles
Coats Bell
Coats and Clark
Collingwood Fabrics Inc.
Collins & Aikman Canada Inc.
Consoltex Inc.
Cookshire Tex
C.S. Brooks Canada Inc.
Denim Swift
Difco Performance Fabrics Inc.
Fabrene Inc.
Glendale Yarns Inc.
Interface Flooring Systems (Canada) Ltd.
J.L. de Ball Canada Inc.
LaGran Canada Inc.
Lincoln Fabrics Ltd.
Nova Scotia Textiles, Limited
Spinrite Inc.
Stedfast Inc.
St. Lawrence Corporation
Velcro Canada Inc.
VOA Colfab Inc.

Transportation Manufacturing

Accuride Canada Inc.
AlliedSignal Aerospace Canada Inc.
Boeing Toronto Limited
Bombardier Inc.
Cami Automotive Inc.
Canadian General-Tower Limited
DaimlerChrysler Corporation
Ford Motor Company of Canada, Limited
Freightliner of Canada Ltd.
General Motors of Canada Limited
Magna Corporation – Cosma Body & Chassis Systems
Navistar International Corporation Canada
Oetiker Limited
Orenda Aerospace Corporation
Orion Bus Industries
Oxford Automotive Inc. – Suspensions Division, Chatham
Polywheels Manufacturing Limited
Pratt & Whitney Canada Inc.
Presstran Industries
Prévost Car Inc.
Rockwell Automation Canada Inc.
Russel Metals Inc.
Toyota Motor Manufacturing Canada Inc.
Varity Kelsey Hayes Canada Ltd.
Volvo Cars of Canada Ltd.
Woodbridge Group (The)

Carol Buckley
Director
Industrial, Commercial and Institutional Programs Division
Office of Energy Efficiency
580 Booth Street
Ottawa, Ontario K1A 0E4
Tel: (613) 996-4079
Fax: (613) 947-4121
e-mail: cbuckley@nrcan.gc.ca

Margaret Bailey
Senior Industry Officer
Industrial Energy Efficiency Initiative
Office of Energy Efficiency
580 Booth Street
Ottawa, Ontario K1A 0E4
Tel: (613) 943-5316
Fax: (613) 947-4121
e-mail: mbailey@nrcan.gc.ca

Jean-Marc Berrouard
Industry Officer
Industrial Energy Efficiency Initiative
Office of Energy Efficiency
580 Booth Street
Ottawa, Ontario K1A 0E4
Tel: (613) 943-2224
Fax: (613) 947-4121
e-mail: jberroua@nrcan.gc.ca

Marlene Blakney
Senior Industry Officer
Industrial Energy Efficiency Initiative
Office of Energy Efficiency
580 Booth Street
Ottawa, Ontario K1A 0E4
Tel: (613) 996-8278
Fax: (613) 947-4121
e-mail: mblakney@nrcan.gc.ca

Magella Bouffard
Junior Industry Officer
Industrial Energy Efficiency Initiative
Office of Energy Efficiency
580 Booth Street
Ottawa, Ontario K1A 0E4
Tel: (613) 996-3799
Fax: (613) 947-4121
e-mail: mbouffar@nrcan.gc.ca

Mark Butkus
Writer/Editor
Industrial Energy Efficiency Initiative
Office of Energy Efficiency
580 Booth Street
Ottawa, Ontario K1A 0E4
Tel: (613) 947-0125
Fax: (613) 947-4121
e-mail: mbutkus@nrcan.gc.ca

Johanne Geoffrion
Senior Industry Officer
Industrial Energy Efficiency Initiative
Office of Energy Efficiency
580 Booth Street
Ottawa, Ontario K1A 0E4
Tel: (613) 992-8003
Fax: (613) 947-4121
e-mail: jgeoffri@nrcan.gc.ca

Philip B. Jago
Chief
Industrial Energy Efficiency Initiative
Office of Energy Efficiency
580 Booth Street
Ottawa, Ontario K1A 0E4
Tel: (613) 995-6839
Fax: (613) 947-4121
e-mail: pjago@nrcan.gc.ca

Vaughn Munroe
Senior Industry Officer
Industrial Energy Efficiency Initiative
Office of Energy Efficiency
580 Booth Street
Ottawa, Ontario K1A 0E4
Tel: (613) 947-1594
Fax: (613) 947-4121
e-mail: vmunroe@nrcan.gc.ca

The Aero Space Industries Association of Canada

The Alliance of Manufacturers and Exporters Canada (AEC)
- The AEC Ontario Division
- The AEC Alberta Division
- The AEC Newfoundland Division
- The AEC Nova Scotia Division
- The AEC New Brunswick Division
- The AEC Manitoba Division
- The AEC British Columbia Division
- The AEC Prince Edward Island Division

The Aluminum Industry Association

The Automotive Parts Manufacturers' Association

The Canadian Association of Man Made Vitreous Fibre Manufacturers

The Canadian Cement Council (The Canadian Portland Cement Association)

The Canadian Chemical Producers' Association

The Canadian Fertilizer Institute

The Canadian Foundry Association

The Canadian Gas Association

The Canadian Lime Institute

The Canadian Meat Council

The Canadian Pulp and Paper Association

The Canadian Petroleum Products Institute

The Canadian Plastics Industries Association

The Canadian Steel Environmental Association (Canadian Steel Producers Association)

The Canadian Textiles Institute

The Canadian Vehicle Manufacturers' Association

The Council of Forest Industries

The Food and Consumer Products Manufacturers of Canada

The Mining Association of Canada

The National Dairy Council

The Ontario Food Producers' Association

The Rubber Association of Canada

Annual Census of Mines
NRCan survey that collects information on SIC 06 and SIC 08.

Annual Survey of Manufacturers (ASM)
Statistics Canada survey. Provides information on the consumption of purchased fuels and electricity for approximately 230 subsectors at four-digit SIC code levels.

Base Year
A reference year. For the Framework Convention on Climate Change, 1990 is the base year.

Climate Change Voluntary Challenge and Registry (VCR) Inc.
The VCR Inc., is a key element of Canada's National Action Program on Climate Change. It encourages the private and public sectors to take voluntary steps to limit or reduce GHG emissions. As a first step, participants are encouraged to submit a letter of intent confirming a commitment to limit or reduce GHGs from their operations. This is followed by an action plan and subsequent progress reports. The Industrial Energy Innovators Initiative provides a means for manufacturing and mining companies to enroll in the VCR Inc.

CO_2
A compound of carbon and oxygen that in its normal gaseous state is clear and colourless. CO_2 is formed whenever carbon-bearing fuels are burned. It can also be formed via other reactions not involving combustion.

Economic Energy Intensity
Energy consumption per unit of economic output.

Embodied Energy
The energy consumed to transform all upstream raw materials into the final product; in a life cycle approach, it would be the "cradle-to-grave" energy burden.

Energy Intensity
Energy consumption per unit of output.

Energy Intensity Indicator
A dimensionless ratio equal to the energy intensity in a particular year divided by the energy intensity of the base year. The energy intensity indicator for the base year equals 1.0.

Energy Performance Measures
Any of a variety of metrics that would indicate an aspect of energy performance.

Framework Convention on Climate Change (FCCC)
United Nations convention to address climate change signed by more than 150 countries at the United Nations Conference on Environment and Development in Rio de Janeiro in June 1992. Canada became the eighth country to ratify the Convention, which entered into force on March 21, 1994, thereby committing to work toward stabilizing GHG emissions at 1990 levels by the year 2000.

Greenhouse Gas (GHG)
A GHG absorbs and radiates heat in the lower atmosphere that otherwise would be lost in space. The greenhouse effect is essential for life on this planet since it keeps average global temperatures high enough to support plant and animal growth. The main GHGs are carbon dioxide (CO_2), methane (CH_4), chlorofluorocarbons (CFCs) and nitrous oxides (N_2O). By far the most abundant greenhouse gas is CO_2, accounting for 70 percent of the greenhouse effect.

Gross Domestic Product (GDP)

The total value of goods and services produced by the nation's economy before deduction of depreciation charges and other allowances for capital consumption, labour and property located in Canada. It includes the total output of goods and services by private consumers and government, gross private domestic capital investment and net foreign trade. GDP figures are reported in real 1986 dollars.

Higher Heating Value

The amount of heat that is obtained when a specified amount of fuel is combusted with its stoichiometrically correct amount of air, both being at 15°C when combustion starts, and the products of combustion being cooled to 15°C before the heat release is measured (also called gross calorific value or gross heating value).

Industrial Consumption of Energy Survey (ICE)

Statistics Canada survey on energy use. Covers purchased and nonpurchased energy for approximately 24 industrial subsectors.

Lower Heating Value

The higher heating value minus the latent heat of vaporization of the water vapour formed by the combustion of any hydrogen present in the fuel. For a fuel with no hydrogen, the higher and lower heating values are the same (also called the lower calorific value or the net heating value).

Natural Resources Canada (NRCan)

The predominant natural resource department of the federal government, NRCan has a mandate to promote the sustainable development and responsible use of Canada's mineral, energy and forestry resources and to develop an understanding of Canada's land mass.

Physical Energy Intensity

Energy consumption per unit of physical output.

Quarterly Report on Energy Supply and Demand (QRESD)

Provides an energy balance of all energy consumption in Canada. QRESD data on the manufacturing industries are mainly gathered by the Industrial Consumption of Energy (ICE) survey. These data are supplemented by other surveys on the disposition of energy (from utilities) and the production of petroleum products.

Specific Energy (Consumption)

Energy consumption per physical unit of output (also called physical energy intensity).

Standard Industrial Classification (SIC)

Statistics Canada uses a classification system that categorizes establishments into groups with similar economic activities.

Statistics Canada

Statistics Canada is the country's national statistical agency, with programs organized into three broad subject areas: demographic and social, socio-economic and economic. Under the *Statistics Act*, Statistics Canada is required to collect, compile, analyse, abstract and publish statistical information on virtually every aspect of the nation's society and economy. All information given to Statistics Canada through surveys, the census or any other source is confidential. Statistics Canada does not release any information that identifies an individual or organization.

Tier I

Informal designation by CIPEC of industries that are major energy-consuming industries. The seven designated Tier I industries are Pulp and Paper, Petroleum Refining, Cement, Mining, Steel, Chemicals and Aluminum. The Tier I industries account for approximately 80 percent of total Canadian industrial energy consumption.

Tier II

Informal designation by CIPEC of industries that are minor energy-consuming industries (relative to Tier I industries) but contribute substantially to Canadian industrial GDP. Tier II industries account for 60 percent of Canadian industrial GDP.

Canadian Industry Program for Energy Conservation
c/o Natural Resources Canada
Office of Energy Efficiency
580 Booth Street, 18th Floor
Ottawa, Ontario
K1A 0E4
Tel.: (613) 995-6839
Fax: (613) 947-4121
E-mail: cipec.peeic@nrcan.gc.ca

anadian Industry Program for

ENERGY CONSERVATION

1999/2000 ANNUAL REPORT

Natural Resources Canada
Office of Energy Efficiency

Ressources naturelles Canada
Office de l'efficacité énergétique

Canada

OEE

Office of Energy Efficiency
Office de l'efficacité énergétique

Leading Canadians to Energy Efficiency at Home, at Work and on the Road

National Library of Canada cataloguing in publication data

Canadian Industry Program for Energy Conservation (CIPEC)

1999/2000

Annual.
Title from cover.
ISBN 0-662-30035-6
Cat. No. M92-143/2000-1E
ISSN 0846-8474

1. Energy conservation – Canada – Periodicals
2. Energy policy – Canada – Periodicals
3. Energy consumption – Canada – Periodicals
I. Canada. Energy, Mines and Resources Canada
II. Canada. Natural Resources Canada

TJ163.4C3 C32 333.791 6'0971

For more information or to receive additional copies of this publication, write to:

Canadian Industry Program for Energy Conservation
c/o Natural Resources Canada
Office of Energy Efficiency
580 Booth Street, 18th Floor
Ottawa, ON K1A 0E4

Tel.: (613) 995-6839
Fax: (613) 947-4121
E-mail: cipec.peeic@nrcan.gc.ca

OUR MISSION

To promote effective voluntary action that reduces industrial energy use per unit of production, thereby improving economic performance while participating in meeting Canada's climate change objectives.

Canadian Industry Program for Energy Conservation

1999/2000 ANNUAL REPORT

Success Stories

Sector Reports

CHAIRMAN'S LETTER

The Honourable Ralph Goodale
Minister of Natural Resources Canada
Ottawa ON K1A 0A6

Dear Minister:

I am honoured to present the Canadian Industry Program for Energy Conservation's (CIPEC's) *1999/2000 Annual Report*, the first since I assumed the Chair of CIPEC's Executive Board.

I am especially delighted that for our 25th anniversary year CIPEC is able to report solid progress toward Canada's goal of greater energy efficiency and reduced greenhouse gas emissions. Through effective energy management, CIPEC industries have achieved an average annual aggregate energy intensity of 2 percent per year for the period 1990–99. The energy saved is equivalent to 73 percent of Canada's residential heating demand in 1998.

Just as notably, the energy-management efforts of CIPEC industries have resulted in energy-related greenhouse gas emissions for the years 1990–99, registering 1.9 percent below 1990 levels, a significant aid to Canada's international climate change commitments. It is clear that the voluntary approach espoused by our organization delivers results.

Achieving this milestone has taken a great deal of work – by our 23 task forces and 38 industry trade associations, as well as the many companies from the manufacturing and mining sectors.

Interest in energy efficiency among individual companies continues to grow. Across the country, energy conferences and workshops sponsored by CIPEC sector task forces are attracting greater numbers of participants. Many companies are following seminar attendance with a new or renewed commitment to energy efficiency. In step with our goal of "more active companies in the program and more active programs in the companies," task force initiatives to increase CIPEC participation have also delivered results, with 50 companies joining the Industrial Energy Innovators Initiative in 2000 alone. The drive for industrial energy efficiency clearly has momentum.

CIPEC has made great progress in its first quarter century, thanks in large part to the Government of Canada's support for voluntary action. The combined resources of business and government have made CIPEC an exceptional success story and a model for other organizations around the world. With your continued encouragement and support, I am convinced that CIPEC will build on the outstanding results of its first 25 years to achieve even more in the years ahead.

W. Warren Holmes
Senior Vice-President, Canadian Mining Operations, Falconbridge Ltd.
Chair, CIPEC Executive Board

HOW CIPEC WORKS

CIPEC is an umbrella organization overseeing a partnership between government and private industry aimed at improving Canada's industrial energy efficiency. CIPEC is composed of sectoral task forces, each of which represents companies engaged in similar industrial activities who participate through their trade associations. The Task Force Council, with representatives from each CIPEC sector, provides a common forum for sectors to share ideas and recommend ways to address common needs. Overall direction is provided by an Executive Board made up of private sector leaders committed to industrial energy efficiency.

CIPEC's extraordinary public-private relationship is successful because it is built not on government regulation, but on trust. In the CIPEC partnership, voluntary change emerges from consensus and joint action built through open and honest communication.

CIPEC continues to be the focal point for the manufacturing and mining response to Canada's National Action Program on Climate Change. Our role is to promote the evolution of energy efficiency and to identify and reward those who lead the way.

We carry out this mandate in part through a strong communications and awareness program grounded in our twice-monthly *Heads Up CIPEC* newsletter and regular features in selected trade magazines. *Heads Up CIPEC*, which was first published three years ago with a circulation of 55, now has 2000 subscribers and boasts a readership of more than 6000. Our communications programs celebrate energy efficiency innovations and the industry leaders behind them and provide ideas to improve business and economic benefits through reductions in energy use.

CIPEC also raises awareness of the goals and benefits of improved energy in other ways. Non-competitive information is exchanged at regular sector task force meetings. The Task Force Council and individual sectors are constantly at work to broaden participation and to bolster public and industry awareness of the role and achievements of CIPEC industries.

CIPEC volunteers include successful business leaders and others recognized on the national stage. The quality and profile of these leaders and their strong belief in voluntary change without government regulation give CIPEC a strong edge in attracting new industry participants and in continuing the successful partnership between industry and government.

VOLUNTARY CO-OPERATION YIELDS IMPRESSIVE RESULTS

The Canadian Industry Program for Energy Conservation's (CIPEC's) silver anniversary was truly a landmark year for an exceptional organization. Throughout 1999/2000, the ongoing efforts of hundreds of people in the public and private sectors across Canada enabled CIPEC to establish milestones, which proves, yet again, that voluntary co-operation between business and government can deliver impressive results. Notably, CIPEC has demonstrated growing momentum and a record of achievement unmatched by any organization of its type in the world.

HERE ARE A FEW OF THE ORGANIZATION'S MOST SIGNIFICANT ACHIEVEMENTS IN 1999/2000

- Companies under the CIPEC umbrella averaged an energy intensity improvement of 2 percent per year between 1990 and 1999, well above the 1-percent-per-annum improvement commitment made in 1994. For the period 1990–99, the total energy saved by Canadian industry is equivalent to 73 percent of Canada's residential heating demand in 1998.
- Thanks to effective energy management, CIPEC industries reduced energy-related greenhouse gas (GHG) emissions to 1.9 percent below 1990 levels by 1999, a significant aid to Canada's international climate change commitments.
- The addition of two new task forces during the past reporting period means that there are now 23 task forces participating in CIPEC.
- Association participation has also increased as four new trade associations signed letters of co-operation, bringing total participation to 38 trade associations.

- At the time this report was being written, 294 companies had made individual commitments as Industrial Energy Innovators, an increase of 50 companies from the previous year. The growth in this number indicates an increasing awareness of the importance of energy management to the success of businesses in all sectors.

Natural Resources Canada's (NRCan's) statistics indicate that energy use by CIPEC industries has increased just 9.1 percent between 1990 and 1999, while their gross domestic product (GDP) has risen by 31.5 percent.

Effective energy management is doing good things for the environment, as well as improving the bottom line of Canadian business. The investments made in energy-saving technology and the implementation of efficient new processes are helping participating businesses to cut costs and increase profits. Companies are discovering that energy efficiency improvements are almost always linked to gains in business performance.

All of CIPEC's remarkable success comes solely from voluntary efforts on a national scale. With the government's support, energy efficiency initiatives are emerging from nearly every industrial sector in Canada. Individually and together, manufacturing and mining companies are helping Canada to improve its energy efficiency, cut its GHG emissions and meet its international climate change commitments.

This report documents the results achieved by mining and manufacturing companies in the 1999/2000 reporting year. It also highlights a few of the companies who have backed their commitment to energy efficiency with action and presents the statistics behind their combined success.

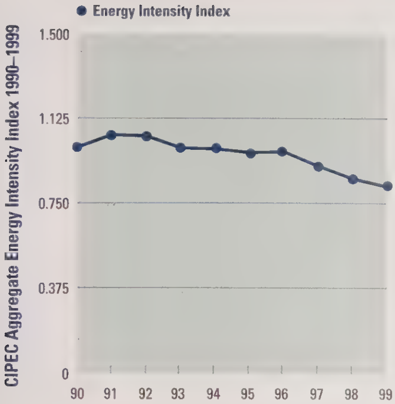
THE EVOLUTION OF CIPEC DATA

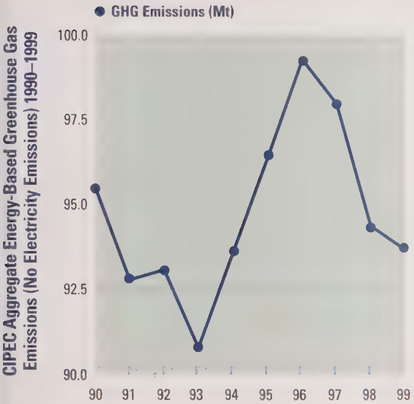
Accurate measurement and meaningful data are fundamental to measuring energy efficiency improvements. The data used in this report are collected by Statistics Canada and interpreted by the Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC) at Simon Fraser University in Burnaby, British Columbia. From Statistics Canada data, CIEEDAC produces energy intensity indicators for each sector based on production and GDP. CIPEC continues to collaborate with Statistics Canada and CIEEDAC in ongoing efforts to ensure measurement accuracy and acceptability.

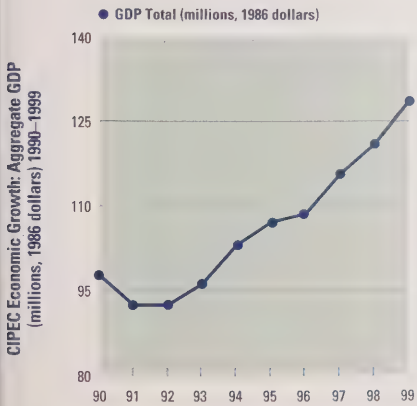
The co-operative CIEEDAC system is internationally recognized for its methodologies, data integrity and co-operation with CIPEC. Primary funding for CIEEDAC comes from CIPEC and NRCan with additional contributions from industry associations and the province of Quebec.

CIPEC IN GROWTH MODE

Although it is the world's oldest voluntary industrial energy efficiency program, CIPEC continues to widen its influence within Canada's industrial and mining communities. In fact, participation in CIPEC is at an all-time high. There are now 23 sectoral task forces encompassing 38 trade associations. Collectively, they represent approximately 90 percent of secondary industrial energy demand.







Equally important, the engagement of individual company participation within these sectors is increasing. Since the last report, the number of organizations signing on as Industrial Energy Innovators has grown by more than 50. Companies are flocking to energy conferences in record numbers and are following up by making major capital and operational commitments to improve energy efficiency.

IMPRESSIVE RESULTS

Effective energy management is having a positive effect on Canada's energy intensity. CIPEC's overall annual average aggregate improvement in energy intensity from the 1990 base year through 1999 is 2.0 percent per year, exceeding CIPEC's overall target of 1.0 percent per year. From 1990 through 1999, energy-use-related GHG emissions were 1.9 percent below 1990 levels.

A weakening economy will now challenge CIPEC industries to build on existing momentum. The extent of capital investment in new technologies – regardless of their returns – is dictated by the size of the corporate balance sheet. Reduced revenue, arising from declining sales, means less money for continuing improvements. On the other hand, opportunities may arise to develop innovative financing techniques through "out of the box" thinking. The CIPEC business plan includes efforts to draw upon the collective thinking of the engineering and financial communities to help industry come up with creative solutions to continue going forward.

INDIVIDUAL EXCELLENCE

Many companies active in CIPEC sectors achieved energy efficiency excellence in the 1999/2000 year. We highlight 11 such companies in the "Success Stories" section of this report. In addition, three companies are among the recipients of Canada's Energy Efficiency Awards 2000, administered by NRCan's Office of Energy Efficiency (OEE). The awards recognize companies in all sectors of the economy that exhibit excellence in their energy efficiency efforts.

Companies that received the awards are:

- Crown Cork & Seal Canada Inc., for a program to capture air compressor waste heat and use it to preheat water for washing cans at its Calgary, Alberta, plant. This common-sense approach has reduced

natural gas consumption for boiler operations by 5 percent and is saving $12,000 a year in energy costs.

- Lake Erie Steel Co. for using waste steam generated from blast furnace gas to power compressors in the smelter's cryogenic air-separation plant. As a result of this creative approach, the company has reduced its electricity costs by about $1.7 million annually and achieved significant and enduring environmental benefits.
- DuPont Canada Inc., for improving its per-unit energy consumption by 28 percent between 1990 and 1999 through research, effective networking and the strategic application of new energy technologies. The company's Manufacturing Energy Management Team has provided leadership in integrating energy conservation and energy efficiency opportunities with DuPont's constantly evolving business priorities.

CIPEC, itself, has also been recognized for excellence. NRCan's OEE has awarded the organization a Special Recognition Award, citing CIPEC's important, lasting and ongoing contribution to the field of energy efficiency in Canada. CIPEC was also awarded the 1999 Association Leadership Award by Canada's Climate Change Voluntary Challenge and Registry Inc. (VCR Inc.).

INNOVATION AND CANADA'S CLIMATE CHANGE VOLUNTARY CHALLENGE AND REGISTRY INC. (VCR INC.)

The Industrial Energy Innovators Initiative helps companies put sector-level commitments into action at the individual corporate level. At the time this report was being written, 294 companies representing approximately 80 percent of industrial energy use had signed on as Industrial Energy Innovators. The majority of these companies are participants in VCR Inc.

CIPEC has strengthened the participation of Industrial Energy Innovators in VCR Inc. through a number of programs. These include programs to increase awareness of the economic benefits of improved energy use and tools to remove barriers hindering energy-management improvement projects within companies. CIPEC believes that parallel efforts among like-minded organizations are needed to maximize Canada's industrial energy efficiency.

NEW TARGETS

On October 11, 2000, CIPEC's Executive Board announced that it had extended its energy intensity improvement target for another five years. The new target aims to improve energy intensity by 1 percent per year between 1990 and 2005. Given the present economic slowdown, this may be a greater challenge than anticipated because of capital rationing – at least in the short term. As well, it will become increasingly difficult to exploit so-called low-hanging fruit.

A NEW LEADER

In 2000, CIPEC named W. Warren Holmes as Chairman of its Executive Board. Mr. Holmes is Senior Vice-President, Canadian Mining Operations, Falconbridge Ltd., and succeeds Peter H. Cooke, Executive Vice-President, Cement, Lafarge Corporation. Mr. Holmes has 35 years of experience in the mining industry, working first with Noranda Mines Ltd. and, since 1986, with

Falconbridge Ltd. Mr. Holmes is on the boards of the Ontario Mining Association and the Mining Association of Canada and has received a number of industry awards.

Mr. Holmes brings a wealth of experience to this position from his work in the industry as well as on mining association boards. His knowledge, experience and commitment to energy efficiency will make a valuable contribution to CIPEC's ongoing drive to reduce industrial energy intensity.

A NEW FOCUS

In 2000, CIPEC established a new three-year business plan. The plan has set as the organization's goal "more active companies within the program, and more active programs within the companies." Our intention is to continue to broaden CIPEC's reach by encouraging non-participating companies to become Industrial Energy Innovators. We are also seeking to deepen the involvement of companies in all sectors, encouraging them to establish active, formal energy efficiency programs within their operations. This mission is aided by a growing awareness within Canadian industry of the role CIPEC has played in helping companies strengthen their competitive position through improved energy management. As competitors move ahead, no company can afford to be left behind.

THE TASK AHEAD

To encourage more active companies within the program, and more active programs within the companies, CIPEC must expand the reach of its activities and develop new initiatives to broaden and deepen participation. We have established a new three-year target, and we must continue to ensure that we have a full toolbox available to companies seeking to help us meet that target.

This will take commitment from government and from the private sector. CIPEC's exceptional vitality comes from the willingness of both partners to embrace the cause of energy management and to invest both money and time in achieving it. CIPEC has a vital mission, and important work lies ahead if Canada is to meet its international climate change commitments and ensure a secure future for coming generations. CIPEC has achieved a great deal over its 25 years. We must continue to build on these successes in the years to come.

CIPEC TASK FORCE COUNCIL

CIPEC Task Force Council Chair

Peter Torbet
1129 Mill Ridge Road
Arnprior ON K7S 3G8
Tel.: (613) 622-5459

CIPEC Communication Committee

Eric Barry
Past President
Canadian Textiles Institute
66 Slater Street, Suite 1720
Ottawa ON K1P 5H1
Tel.: (613) 232-7195
Fax: (613) 232-8722
E-mail: ebarry@textiles.ca

CIPEC Report

Bob Clapp
Vice-President, Ontario Division
Canadian Petroleum Products Institute
235 Yorkland Boulevard, Suite 510
North York ON M2J 4Y8
Tel.: (416) 492-5677, Ext. 33
Fax: (416) 492-2514
E-mail: bobclapp@cppi.ca

VCR Inc.

Bob Flemington
President
VCR Inc.
170 Laurier Avenue West, Suite 600
Ottawa ON K1P 5V5
Tel.: (613) 565-5151
Fax: (613) 565-5743
E-mail: rflemington@vcr-mvr.ca

Aluminum Sector Task Force

Christian Van Houtte
President
The Aluminium Association of Canada
1010 Sherbrooke West, Room 1600
Montréal QC H3A 2R7
Tel.: (514) 288-4842
Fax: (514) 288-0944
E-mail: associa@aluminium.qc.ca

Brewery Sector Task Force

Margo Dewar
Vice-President, Economic Policy and Programs
Brewers Association of Canada
155 Queen Street, Suite 1200
Ottawa ON K1P 6L1
Tel.: (613) 232-9601
Fax: (613) 232-2283
E-mail: mdewar@brewers.ca

Cement Sector Task Force

Thierry Métro
Vice-President, Eastern Region Operations
Lafarge Canada Inc.
606 Cathcart Street, 8th Floor
Montréal QC H3B 1L7
Tel.: (514) 861-1411, Ext. 3402
Fax: (514) 876-8900
E-mail: thierry.etro@lafarge.com

Chemical Sector Task Force

David G.F. Sansom
President
Sansom and Associates Ltd.
278 Nicholson's Point Road
RR 3
Bath ON K0H 1G0
Tel.: (613) 634-7815
Fax: (613) 634-7816
E-mail: dsansom@cgo.wave.ca

Dairy Sector Task Force

Vivianne Khayat
Director, Communications and Finance
National Dairy Council of Canada
221 Laurier Avenue East
Ottawa ON K1N 6P1
Tel.: (613) 238-4116
Fax: (613) 238-6247
E-mail: vkhayat@ndcc.ca

Electrical and Electronics Sector Task Force

Steve Horvath
President and Chief Executive Officer
Cimatec Environmental Engineering Inc.
931 Progress Avenue
Scarborough ON M1G 3V5
Tel.: (416) 289-8882, Ext. 211
Fax: (416) 289-4185
E-mail: cimatec@ibm.net

Fertilizer Sector Task Force

David Finlayson
Director, Technical Affairs
Canadian Fertilizer Institute
350 Sparks Street, Suite 802
Ottawa ON K1R 7S8
Tel.: (613) 230-2597
Fax: (613) 230-5142
E-mail: dfinlayson@cfi.ca

Food Processing Sector Task Force

Walter Kraus
Director, Environmental Affairs
George Weston Ltd./Loblaw Companies Ltd.
22 St. Clair Avenue East, Suite 1901
Toronto ON M4T 2S8
Tel.: (416) 922-1383, Ext. 5414
Fax: (416) 922-4395 or (416) 922-8713
E-mail: gwlwhk@weston.ca

Foundry Sector Task Force

Judith Arbour
Executive Director
Canadian Foundry Association
1 Nicholas Street, Suite 1500
Ottawa ON K1N 7B7
Tel.: (613) 789-4894
Fax: (613) 789-5957
E-mail: metassn@istar.ca

Adam Promoli
Project Manager
Crowe Foundry Limited
95 Sheffield Street
PO Box 25010
Cambridge ON N3C 4B1
Tel.: (519) 658-9376, Ext. 241
Fax: (519) 658-6190
E-mail: adam@crowefoundry.com

General Manufacturing Sector Task Force

Derek Holden
Retired Chief Executive Officer
c/o Owens Corning Canada
71 Heatherwood Crescent
Unionville ON L3R 8V6
Tel.: (905) 479-7279
Fax: (905) 479-6760
E-mail: djholden@home.com

General Manufacturing Sector Task Force – East

André Desroches
Vice-President, Fabrication, Eastern Canada
EMCO Limited – Building Products
9510 Saint-Patrick Street
LaSalle QC H8R 1R9
Tel.: (514) 364-7528
Fax: (514) 364-4487
E-mail: ades@emcoltd.com

General Manufacturing Sector Task Force – West

Jim Wilson
Plant Manager
Owens Corning Canada
831 Hayter Road
PO Box 595
Edmonton AB T5J 2L1
Tel.: (780) 472-5882
Fax: (780) 472-6601
E-mail: jim.wilson@owenscorning.com

Lime Sector Task Force

Dick Bowman
General Manager
Beachville Lime Limited
PO Box 98
Ingersoll ON N5C 3K1
Tel.: (519) 423-6283, Ext. 290
Fax: (519) 423-6135
E-mail: dick.bowman@carmeusena.com

Meat Sector Task Force

Brad Erhardt
Manager of Waste and Environment
J.M. Schneider, Inc.
321 Courtland Avenue East
Kitchener ON N2G 3X8
Tel.: (519) 741-5000, Ext. 7883
Fax: (519) 749-7409
E-mail: berhardt@jms.ca

Mining Sector Task Force

Lauri Gregg
Director, Energy and Technology Services
Falconbridge Limited
95 Wellington Street West, Suite 1200
Toronto ON M5J 2V4
Tel.: (416) 956-5752
Fax: (416) 956-5839
E-mail: lgregg@falconbridge.com

Oil Sands Sector Task Force

Kees Versfeld
Energy Management Leader
Syncrude Canada Ltd.
PO Box 4009, Mail Drop 2030
Fort McMurray AB T9H 3L1
Tel.: (780) 790-8605
Fax: (780) 790-4875
E-mail: versfeld.kees@syncrude.com

Petroleum Products Task Force

Jack Belletrutti
Vice-President
Canadian Petroleum Products Institute
275 Slater Street, Suite 1000
Ottawa ON K1P 5H9
Tel.: (613) 232-3709, Ext. 209
Fax: (613) 236-4280
E-mail: jackbelletrutti@cppi.ca

Pulp and Paper Sector Task Force

Lucie Veilleux
Manager, Environment and Energy
Forest Products Association of Canada
Sun Life Building
1155 Metcalfe Street, 19th Floor
Montréal QC H3B 4T6
Tel.: (514) 866-6621, Ext. 220
Fax: (514) 866-3035
E-mail: lveilleux@fpac.ca

Rubber Sector Task Force

Don Campbell
President
The Rubber Association of Canada
89 Queensway West, Suite 308
Mississauga ON L5B 2V2
Tel.: (905) 270-8322
Fax: (905) 270-2640

Alternate Address:
47 Cremona Crescent
Nepean ON K2G 0Z9
Tel.: (613) 727-8664
Fax: (613) 228-8572
E-mail: doncamp@inforamp.net

Soft Drink Sector Task Force

Anthony Van Heyningen
Manager, Environmental Affairs
Canadian Soft Drink Association
121 Richmond Street West, Suite 901
Toronto ON M5H 2K1
Tel.: (416) 362-2424
Fax: (416) 362-3229
E-mail: vanheyningen@sympatico.com

Steel Sector Task Force

Sue Olynyk
Senior Energy Specialist
Dofasco Inc.
1330 Burlington Street
PO Box 2460
Hamilton ON L8N 3J5
Tel.: (905) 548-7200, Ext. 6107
Fax: (905) 548-4267
E-mail: susan_olynyk@dofasco.ca

Textiles Sector Task Force

Peter Chantraine
Manager, Energy and Environment
DuPont Canada Inc.
455 Front Road
PO Box 2100
Kingston ON K7L 4Z6
Tel.: (613) 548-5025
Fax: (613) 548-5356
E-mail: peter.chantraine@can.dupont.com

Transportation Manufacturing Sector Task Force

Paul Hansen
Manager, Environmental Affairs
DaimlerChrysler Canada Inc.
2545 Chrysler Centre (CIMS 232-02-02)
Windsor ON N9A 4H6
Tel.: (519) 973-2864
Fax: (519) 973-2613
E-mail: plh2@daimlerchrysler.com

Wood Products Sector Task Force

Jean-Claude Mercier
Vice-President, Eastern Region
Eastern Division
Forintek Canada Corp.
319 Franquet Street
Sainte-Foy QC G1P 4R4
Tel.: (418) 659-2647
Fax: (418) 659-2922
E-mail: jean-claude.mercier@qc.forintek.ca

CIPEC EXECUTIVE BOARD

Peter H. Cooke
Executive Vice-President – Cement
Lafarge Corporation
12950 World Gate Drive, Suite 500
Herndon VA 20170
USA
Tel.: (703) 480-3660
Fax: (703) 480-1636
E-mail: peter.cooke@lafargecorp.com

Peter Darbyshire
Vice-President & General Manager
Graymont Western Canada Inc.
3025-12th Street North East, Suite 190
Calgary AB T2E 7J2
Tel.: (403) 250-9100
Fax: (403) 291-1303
E-mail: tiny@telusplanet.net

Reginald Driscoll
President
Albarrie Canada Limited
85 Morrow Road
Barrie ON L4N 3V7
Tel.: (705) 737-0551
Fax: (705) 737-4044
E-mail: albarrie@albarrie.com

Timothy R. Eby
President
Wabi Iron & Steel Corporation
330 Broadwood Avenue
PO Box 1510
New Liskeard ON P0J 1P0
Tel.: (705) 647-4383
Fax: (705) 647-6954
E-mail: time@onlink.net

Daniel Gagnier
Vice-President
General and Environmental Affairs, Health and Safety
Alcan Aluminium Ltd.
1188 Sherbrooke Street West
Montréal QC H3A 3G2
Tel.: (514) 848-8118
Fax: (514) 848-1494
E-mail: daniel.gagnier@alcan.com

Warren Holmes
Senior Vice-President
Canadian Mining Operations
Falconbridge Limited
95 Wellington Street West, Suite 1200
Toronto ON M5J 2V4
Tel.: (416) 956-5793
Fax: (416) 956-5777
E-mail: wholmes@falconbridge.co

Paul Kelly
President and Chief Executive Officer
Slater Steel Inc.
Markborough Place
6711 Mississauga Road, Suite 202
Mississauga ON L5N 2W3
Tel.: (905) 567-1822
Fax: (905) 567-0946
E-mail: paulkelly@slatersteel.com

Emmie Leung
Chief Executive Officer
International Paper Industries Limited
132 Riverside Drive North
North Vancouver BC V7H 1T9
Tel.: (604) 929-7377, Ext. 210
Fax: (604) 929-3417
E-mail: emmie.leung@ipi.ca

Brenda MacDonald
President
Coyle & Greer Awards Canada Ltd.
4819 Mossley Drive
PO Box 247
Mossley ON N0L 1V0
Tel.: (519) 269-3000, Ext. 233
Fax: (519) 269-3038
E-mail: bmacdonald@coylegreer.com

C.A. (Chris) Micek
Environment, Health and Safety Manager
Agrium Inc.
Bag 20
Redwater AB T0A 2W0
Tel.: (780) 998-6054
Fax: (780) 998-6143
E-mail: cmicek@agrium.com

Geoffrey H. Moore
President
Fibrex Insulations Inc.
561 Scott Road
PO Box 2079
Sarnia ON N7T 7L4
Tel.: (519) 336-7770
Fax: (519) 336-1634
E-mail: gmoore@fibrex.org

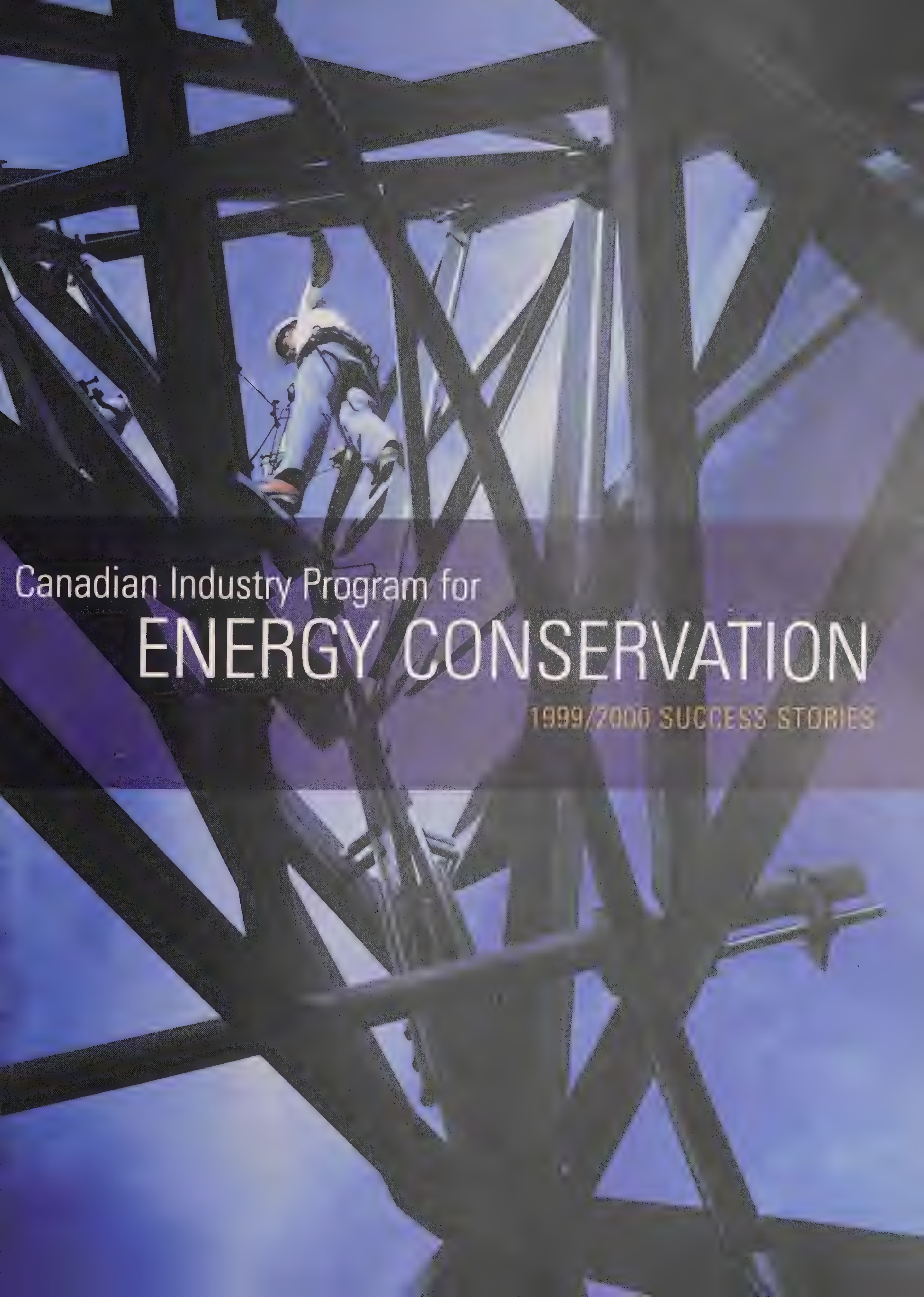
Timothy D. Moore
President & General Manager
The Clorox Company of Canada, Limited
5700 Yonge Street, Suite 1212
Toronto ON M2M 4K2
Tel.: (416) 221-3373
Fax: (416) 221-3238
E-mail: Tim.D.Moore@clorox.com

Ronald C. Morrison
Canadian Manufacturers & Exporters (CME)
1377 Hazelton Boulevard
Burlington ON L7P 4V2
Tel.: (905) 464-5887
Fax: (905) 335-0523
E-mail: rcm161@aol.com

John D. Redfern
Chairman of the Board
Lafarge Canada Inc.
606 Cathcart Street, 8th Floor
Montréal QC H3B 1L7
Tel.: (514) 861-1411, Ext. 3202
Fax: (514) 876-8900
E-mail: john.redfern@lafarge.ca

Andrew Stephens
Vice-President
Refining and Supply
Petro-Canada
2489 North Sheridan Way
Mississauga ON L5K 1A8
Tel.: (905) 804-4565
Fax: (905) 804-4644
E-mail: stephens@petro-canada.ca

Norman J. Stewart
Vice-President
Government Relations & General Counsel
Ford Motor Company of Canada, Limited
The Canadian Road
Oakville ON L6J 5E4
Tel.: (905) 845-2511, Ext. 1104
Fax: (905) 845-5759
E-mail: nstewart@ford.com



Canadian Industry Program for

ENERGY CONSERVATION

1999/2000 SUCCESS STORIES

Innovation in ACTION

In this section are 11 Canadian success stories. They tell of 11 committed companies that have taken decisive action to achieve energy efficiency in their operations. We would like to share these stories with you in this, the 25th anniversary of CIPEC's remarkable voluntary partnership between the private and public sectors.

For a quarter century, CIPEC has demonstrated that volunteerism on a major national scale can work. As of this writing, CIPEC comprised 23 task forces made up of 35 trade and business associations. These associations represent more than 3000 companies and approximately 90 percent of secondary industrial energy demand in Canada. Combined, from 1990 to 1998, the efforts of these companies have forged an annual average improvement in energy intensity of 1.26 percent, well ahead of Canada's national objectives.

Despite CIPEC's maturity, the organization is in a period of energetic growth as manufacturing and mining companies increasingly embrace reduced energy use as an important contributor to operating efficiency. The initiatives emerging from nearly every industrial sector across the country are improving energy efficiency, cutting greenhouse gas (GHG) emissions and helping Canada to meet its international climate change goals. All indications are that interest in energy efficiency and commitment to its advancement have never been greater.

Although the companies highlighted here are worthy of recognition, they represent only a sampling of the hundreds of firms in nearly every industrial sector across our nation that are acting on a commitment to responsible energy use. Over two and a half decades, the participation of such companies has transformed CIPEC into an internationally recognized force for energy efficiency.

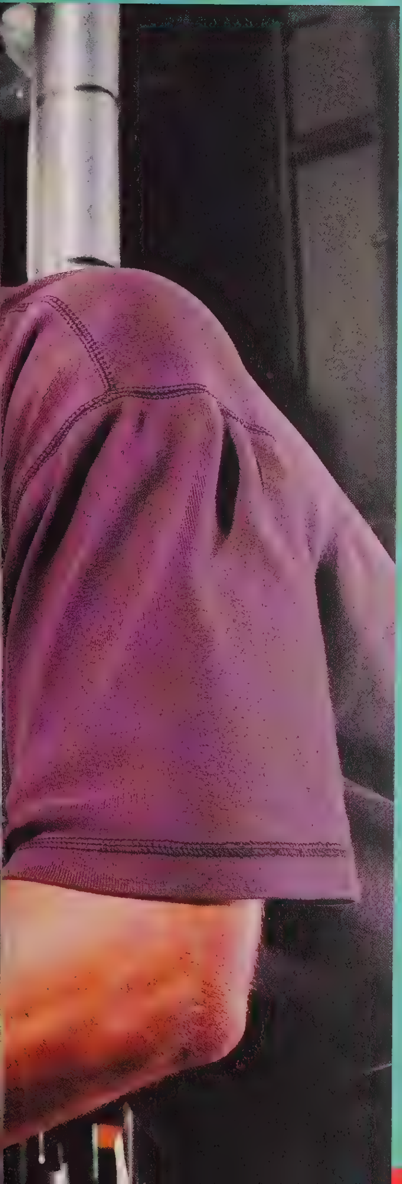
We hope that the following 11 stories will serve as examples to other firms seeking to play a part in a more energy-efficient future. Ultimately, it is the willingness of individual enterprises to change their practices and invest in new methods and technologies that will determine industry's ability to help Canada achieve its international climate change objectives.

Warren Holmes
Senior Vice-President, Canadian Mining Operations, Falconbridge Limited
Chair, CIPEC Executive Board

3M Canada Company

A Global View on

Greenhouse Gases



3M Canada Company is a significant contributor to its parent company's worldwide efforts to boost its energy efficiency by 15 percent between 1995 and the end of 2000.

No newcomer to energy conservation, 3M Canada has made major advances toward meeting this target. It has used a number of means, including life-cycle management, process optimization, improved operating procedures and capital investments such as the installation of high-efficiency motors, heat recovery from steam and exhaust streams, and re-lighting. As a result, the company's manufacturing facilities have already reached their energy reduction targets, and other operations are below the trend line.

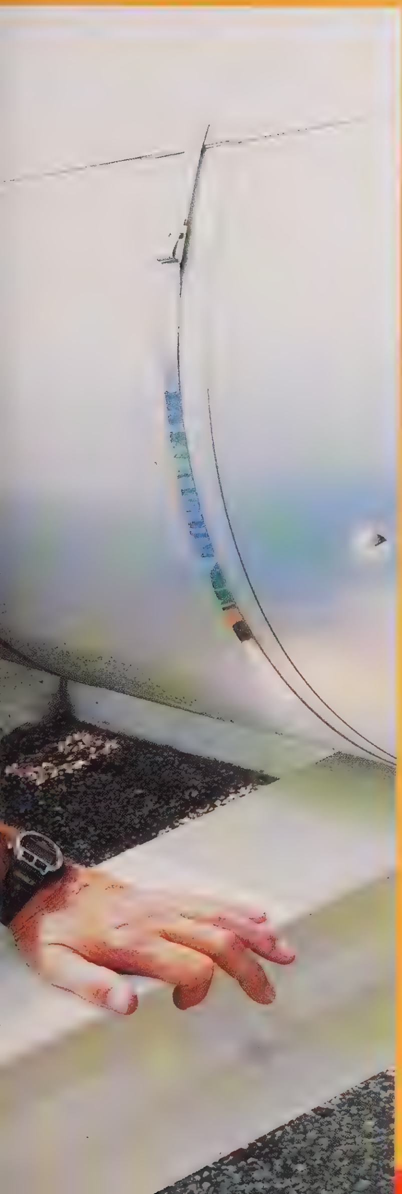
The company has moved beyond energy cost considerations to GHG concerns. Internationally, 3M is drafting a corporate position and action plan related to global warming. In Canada, the company began tracking its GHG emissions three years ago, a practice that is enabling it to set goals and benchmark its continuously improving environmental performance. Directly tied to energy consumption, GHG tracking includes everything from plant processes to company vehicles. With six manufacturing sites in Ontario and Manitoba and sales offices in major cities across Canada, 3M's GHG monitoring program is a significant means of gathering important decision-making data to effectively reduce GHG emissions.

Boeing Toronto Limited

Energy Conservation

Takes Flight

at Boeing



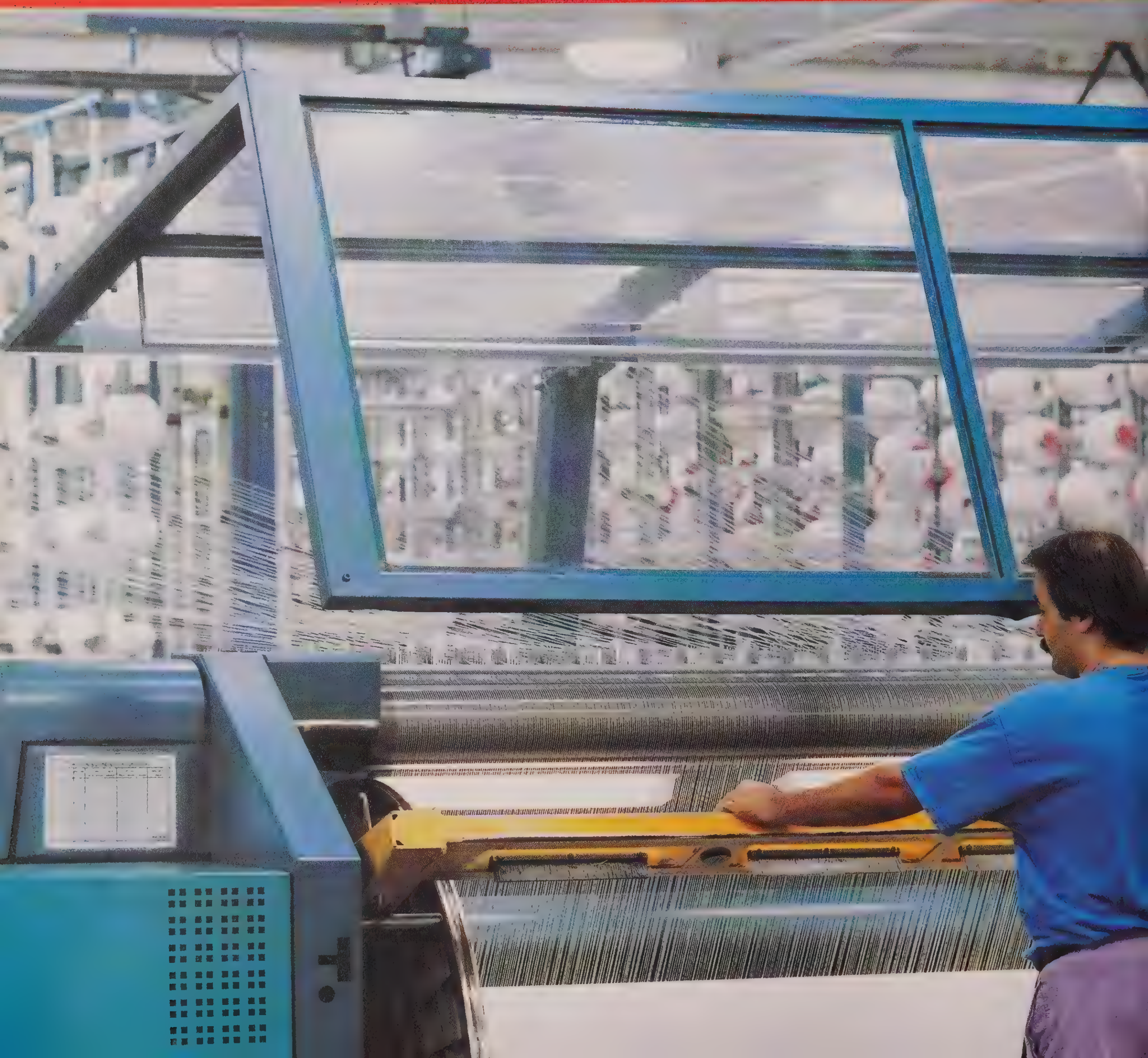
Boeing Toronto Limited's energy-reduction strategy is saving the company a quarter of a million dollars per year.

The company installed an upgraded energy-management system at its Toronto facility that monitors its heating, ventilating and air-conditioning (HVAC) systems and employs immediate electricity load shifting and shedding as demand changes. Boeing also retrofitted the HVAC system that serves its offices to better control air temperature. The system is now equipped with a manual override that saves on operating costs during off-peak and weekend periods. The company revamped its ventilation systems to cut down unnecessary airflow, reduce heating-coil operation and enable the shutdown of 17 exhaust fans. A major lighting retrofit replaced 1800 office-area fixtures with energy-efficient T-8 lamps and electronic ballasts. This move not only saves on lighting costs—the reduced heat generated by the new lamps also cuts air-conditioning loads.

Steam for heating accounts for two-thirds of the Toronto facility's total energy consumption. By purchasing by-product steam from a neighbouring cogeneration plant and installing steam-pressure reduction technology, the company is saving substantially on its energy costs. In total, Boeing Toronto's energy initiatives have reduced its energy consumption by 14 percent, leading to an investment payback of less than two years.

Consoltex Inc.

Energy Efficiency



ooms Large for Textile Company

The textile giant Consoltex Inc. took action when energy audits of its facilities in 1995 identified opportunities for improvement.

The company introduced a five-year program at its Alexandria (Ontario) and Montmagny (Quebec) plants to improve insulation and reduce heat loss by replacing roofs, windows and doors. At its finishing plant in Cowansville (Quebec), the company installed a Solarwall®, which recovers heat energy from the building and the sun while still allowing air exchange. In all of its five facilities, a lighting retrofit is replacing older, inefficient equipment with energy-efficient metal halide systems. The company has also launched improvements to its compressed air systems, including the installation of diaphragms to optimize air utilization and repairing air leaks on its jet looms. These programs and others that are under way throughout the company have cut energy costs while reducing effluent discharges and stack emissions.

By monitoring its energy use on an ongoing basis, keeping employees involved in its environmental program and committing itself to continuously improving its energy efficiency, Consoltex is making strong progress toward a targeted 5-percent reduction in energy used per unit of production.

Husky Injection Molding Systems Ltd.

An Environmenta

State of Mind

Husky Injection Molding Systems Ltd. has issued a challenge to each of its businesses: rethink the way things are done to become as energy efficient as possible.

Its businesses are responding. When four new buildings were added at the company's complex in Bolton, Ontario, in the 1990s, the latest energy and environmental innovations were incorporated into their design. From pre-cast wall sections and argon-filled windows to energy-efficient motors and hand dryers, all building systems were designed to be environmentally friendly.

Throughout its growing campus, Husky has introduced a number of energy-saving projects that range from upgrades to transformers to the use of occupancy sensors to control lighting systems. Combined improvements made throughout the 1990s have led to annual power savings of nearly 595 000 kWh and natural gas savings of more than 500 000 m^3.

At the beginning of 2000, Husky launched "GreenShares," a program that rewards employees who make climate-change-conscious decisions part of their daily lives with shares in the company. By establishing a sound environmental policy within its own operations and promoting it in the community, Husky has become a recognized leader in the march toward energy efficiency.

IBM Canada Ltd.

Energy Master Plan

Drives Efficiency at High-Tech Firm

IBM Canada Ltd. wants to be known as a leader—not only in technology but in environmental conservation as well.

It is pursuing this quest with a concerted effort to improve energy efficiency. The company's Energy Master Plan, part of its ISO 14001 Environmental Management System, includes annual submissions by all of its major locations. This enables IBM to track its overall performance and assist local sites to manage their energy-conservation efforts. The company is combining energy efficiency initiatives (including manufacturing process improvements and infrastructure upgrades to lighting, motors and HVAC control) with operational efficiency programs such as space and site consolidation to substantially improve its energy picture.

The results have been impressive. For example, in 1998 an HVAC optimization program and other efforts resulted in power savings of nearly 20 000 MWh. The company's 1999 program, which included lighting retrofit projects and improvements to water-handling systems at one of its large plants, targeted a 4-percent reduction in energy use. In total, from 1990 to 1998, the company has reduced its use of energy by 36 percent and slashed its carbon dioxide emissions by 32 percent. These gains are helping the company to save on its energy expenditures while minimizing the impact of its operations on the environment.

NOVA Chemicals Corporation

Energy Efficiency Brings

he Right Chemistry to NOVA Chemicals

Industrial Energy Innovator NOVA Chemicals Corporation is finding new ways to do more work with less energy throughout its operations.

At its site in Joffre, Alberta, NOVA Chemicals is building a $380-million cogeneration plant to supply all of the site's steam and electricity needs. By also supplying electricity to the Alberta Interconnected System, the plant will reduce indirect emissions of GHG by system users by approximately 2546 kilotonnes annually. At the company's facility in Corunna, Ontario, a flare-reduction program is reducing emissions and improving fuel efficiency. NOVA Chemicals is also evaluating the recovery of by-product carbon dioxide for commercial sale. Positive initial results have led the company to continue its research.

Looking closely at its processes, NOVA Chemicals has successfully tested the use of lower temperatures in the ethylene furnaces at Joffre, demonstrating that it is possible to improve productivity and save fuel. In addition, the company is actively seeking ways to improve the efficiency of its energy-intensive distillation processes.

It takes a lot of energy to produce more than 4 million tonnes of ethylene and polyethylene each year. Thanks to fresh thinking and a willingness to invest to improve its performance, NOVA Chemicals has become an industry energy efficiency leader.

Parkland Refining Ltd.

Thinking Small

Brings Big Return to Parkland

Producing 6300 barrels per day, Parkland Refining Ltd.'s refinery in Bowden, Alberta, is one of the Canadian industry's smallest. But with an energy efficiency index improvement of more than 25 percent over the last decade, Parkland has achieved big-time results.

The refinery has achieved its most significant energy cost savings by increasing production. Increased throughput has enabled process heaters to operate at optimum efficiency and spread heat losses over greater volumes of production, leading to a 10-percent efficiency gain. The installation of new platformer exchangers in 1995 has enabled more heat to be captured and returned to the process, while a new, more efficient crude heater has also boosted energy efficiency. Together, this equipment has improved energy efficiency by 7 percent.

Parkland has also paid close attention to the small details of energy consumption. The company installed variable-speed drives for air-cooler fans and is ensuring that all replacement electric motors throughout the refinery are high-efficiency units.

Parkland Refining is living proof that no matter what the size, a company that is motivated to improve its facilities, processes and practices can make large gains in energy efficiency.

PCI Chemicals Canada, Inc.

2-Percent Solution

he Key to Energy Efficiency

PCI Chemicals Canada, Inc. knows that when you're a big power user, improvements as small as 2 percent can have a major impact on your operating costs.

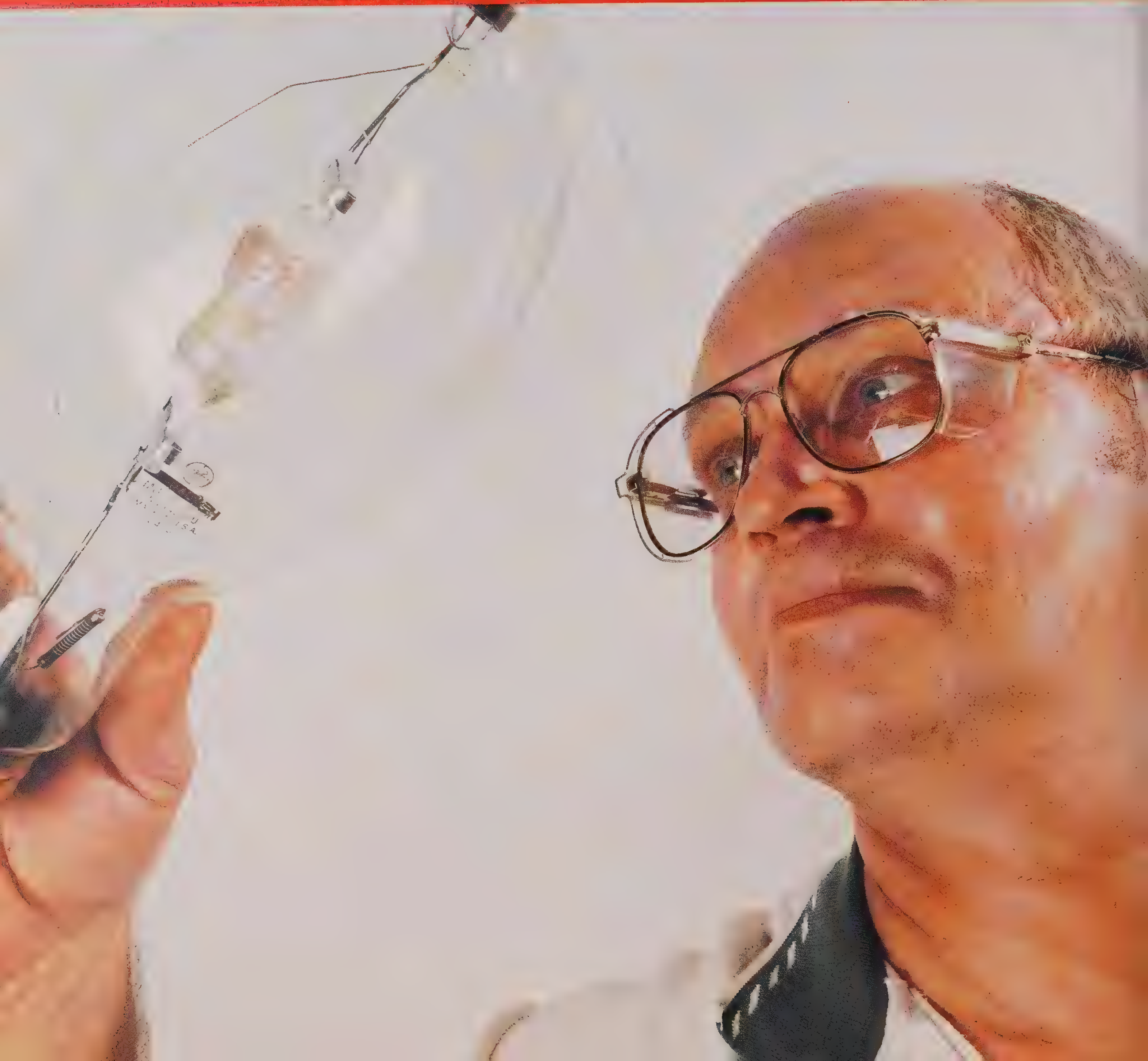
For example, by re-rating equipment at its facility in Dalhousie, New Brunswick, to operate at higher temperatures, the company improved the facility's energy efficiency by 2 percent—a substantial gain for an operation using 28 MW of power each year. Another 2 percent was cut by converting one of the plant's chemical waste streams into usable product. Since 1993 the plant has used hydrogen—a by-product of its processes—as a non-polluting boiler fuel, and it has recently launched a project to divert waste steam from one operation for use in another.

At its facility in Bécancour, Quebec, PCI has invested $30 million to expand production and reduce energy usage. The company installed state-of-the-art membrane cells that increase the plant's chlor-alkali capacity by 12 percent. The cells are also 20 to 25 percent more efficient than their alternatives, enabling the company to substantially decrease energy usage per tonne of production.

By combining innovative thinking with investments in new technology, PCI Chemicals Canada continues to advance the cause of energy efficiency.

S.C. Johnson and Son, Limited

Improving Energy



Efficiency Takes a Team Effort

Key employees at S.C. Johnson and Son, Limited are working together to reduce the energy used per unit of production.

An interdepartmental team of senior managers is steering the company's efforts as it looks at all corners of the company's operations in Brantford, Ontario, and introduces improvements. The goal is a reduction in energy used per unit of production of 15 percent by the end of 2000. Thanks to teamwork throughout the company, S.C. Johnson reduced energy consumption per unit of production by 9.7 percent by the end of 1999 compared to its 1995 base year.

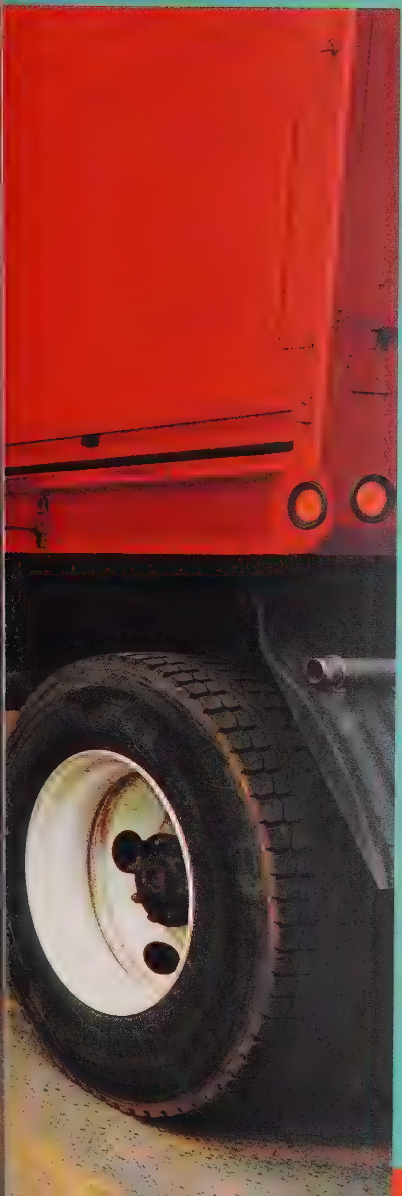
The company continues to take advantage of energy-efficient technologies. For example, a lighting retrofit at the beginning of the year modernized all illumination systems in its 32 500 m^2 (350 000 sq. ft.) facility. In the summer, the company began upgrading its compressed-air system to air-cooled technology that not only saves energy, but provides heat that is reclaimed for space heating. The energy team is also exploring the installation of an energy-efficient HVAC system.

An organization with well-established and widely practised environmental values, S.C. Johnson continues to build on a record of success that includes numerous international awards for environmental leadership.

Seaman's Beverages Limited

Family-Owned Company

Combines Commitment with Action



As one of Canada's few remaining family-owned, independent beverage companies, Seaman's Beverages Limited of Charlottetown, Prince Edward Island, can look far back into Canada's history. But when it comes to energy efficiency, the company looks toward the future.

Seaman's commitment to the environment is wide-reaching. The company has long sold its products in refillable containers, years before provincial law mandated the practice for environmental reasons. Thanks to its commitment to this program, Seaman's has achieved North America's highest return rate on bottles—97 percent—and reclaims 9 million aluminum bottle caps each year for recycling.

Within the company, there is an uncommon level of commitment to energy conservation, as employees actively participate with the company in efforts to reduce energy use and control costs. Thanks to employees' efforts, all vehicles are turned off when making deliveries. Delivery trucks are equipped with retread tires, and waste paper is collected, shredded and donated to a local animal shelter. Combining common sense with a zealous approach to managing its energy use, Seaman's installed motion-sensitive lighting throughout its production facility, ensuring that lights are on only in areas where people are working. To support a concern for PEI's environment that is shared by management and employees alike, the company regularly keeps everyone informed on energy and environmental issues.

Syncrude Canada Ltd.

New Technologies

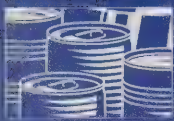
Slash Energy Use at Syncrude Mine

Syncrude Canada Ltd.'s new Aurora mine, north of Fort McMurray, Alberta, is the first to combine the water-based transport of raw materials with low-energy bitumen extraction.

Departing from its historical use of draglines, bucketwheels and conveyor systems, the company has installed hydro-transport technology at the mine—a more efficient means of transporting oil sands for processing. Efficiency isn't the only benefit of the new technology. As an added bonus, bitumen begins to separate from sand while it is moving, enabling the use of lower temperatures during extraction. Hydro-transport has enabled Syncrude to install a new extraction process that operates at only 25°C (77°F)—40 percent lower than earlier methods. Although the energy-efficient new technologies at the mine will bring Syncrude major capital cost savings and long-term operating cost savings, the company is continuing its efforts to develop, refine and simplify processes to further reduce energy use.

The Aurora mine is an integral part of the company's $8.2 billion Syncrude 21 project, scheduled for completion by 2008. Syncrude 21 will see the investment of nearly $1 billion in new technologies and processes with direct environmental benefits.

SECTOR REPORTS



PROFILE ***Canada's aluminum sector ranks fourth in the world in annual primary aluminum production. The combined output of the industry's 10 aluminum plants in Quebec and one in British Columbia is a major contributor to Canada's national and local economies. While production increases have forced the industry's total energy usage slightly upward, measurements of energy efficiency continue to demonstrate much improved performance compared with the benchmark 1990 levels.***

ALUMINUM

PERFORMANCE HIGHLIGHTS

- Canada's aluminum sector is the world's fourth largest in primary aluminum production.
- Energy represents about one third of the total production cost of primary aluminum.
- Energy efficiency is much improved over benchmark 1990 levels.
- Alcoa (Lauralco, Baie-Comeau and Aluminerie de Bécancour), Alcan and Aluminerie Alouette have all taken major steps to improve energy efficiency.
- At the end of 2000, the Government of Canada announced the creation of the Aluminum Research Institute with an investment of $47 million.
- Since 1990, the sector has reduced its CF_4 and C_2F_6 emissions by nearly 52 percent.

ACTIONS Energy represents about one third of the total production cost of primary aluminum. This factor alone makes efficient energy management a prime objective for all smelters. Motivated by the need to control costs in an era of rising energy costs, sector members continue to actively pursue energy efficiency improvements.

For example, Alcan Aluminium Limited is seeking energy efficiency and greenhouse gas (GHG) emissions improvements from processes and auxiliary services. In 2000, the company shut down its old Soderberg Isle-Maligne smelter and initiated the progressive start-up of its new Alma smelter. Alma uses the most energy-efficient AP-30 Pechiney technology, which delivers an improvement of more than 20 percent in energy performance for electrolysis. Over the last 10 years, Alcan achieved significant reductions of anode effects, and consequently perfluorocarbon (PFC) emissions, in its smelters. Best practices are shared among the plants and, for that purpose, all smelters participated in an Alcan international symposium on anode-effects reduction at the end of 2000. Implementation of further reductions and improved control technologies are supported by Alcan research and development specialists.

Looking ahead, Alcan is establishing a new, long-term GHG-management program for all of its facilities. The TARGET program is designed to enable individual sites to develop appropriate programs leading to ongoing GHG-emissions reductions and will become an integral part of Alcan's business metrics and best practices.

Alcoa Inc. now owns three smelters in Quebec (Aluminerie Lauralco, Inc., Aluminerie de Bécancour Inc. and Aluminerie de Baie-Comeau). All of them are involved in energy conservation and GHG-emissions reduction projects. The strategy at Aluminerie Lauralco's Deschambault plant is to marry people and technology. Since 1993, for example, this strategy has led to a 90-percent reduction in GHGs from anode effects. In addition, a kaizen activity on the use of compressed air eliminated the operation of one of the plant's six compressors, leading to savings of about $500,000 per year. In 1999, Aluminerie de Bécancour Inc. launched projects to reduce natural gas and electricity consumption. The company is also evaluating the feasibility of other energy efficiency initiatives and continues to search for new energy, emissions and waste solutions. Aluminerie de Baie-Comeau improved the anode design in its prebake operation to reduce cell energy consumption and is undertaking several projects, including modernization of the pot-control equipment in its Soderberg operation, in an effort to reduce anode-effect frequency and PFC emissions. Within one of the CIPEC programs, the value analysis tool was used to identify energy reduction potentials in its cast house. Projects were ranked by merit, and the plant is now proceeding with process improvements.

Aluminerie Alouette Inc. completed a three-year cathode repair program in 1999. As a result of this and other process improvements, the company has slashed its energy consumption by more than 500 kWh/t of aluminum produced, a 3.8-percent decrease. Anode effects, the main PFC emissions source, were also cut by a factor of three. In total, the company reduced its energy consumption by 7 percent from 1995 to 2000 while, at the same time, increasing production by 12 percent. To further improve energy efficiency, the company has set its anode-effect frequency goal at zero.

At the end of 2000, the Government of Canada announced the creation of the Aluminium Research Institute with an investment of $47 million. One of the mandates of the institute will be to develop and improve technologies, from the production of primary aluminum to finished products. Technological breakthroughs are certainly possible. For example, Alcoa has announced that it is developing an inert anode which could be commercialized within the next five years. If such a product is brought to market, it will boost both the energy efficiency and production of the entire aluminum industry.

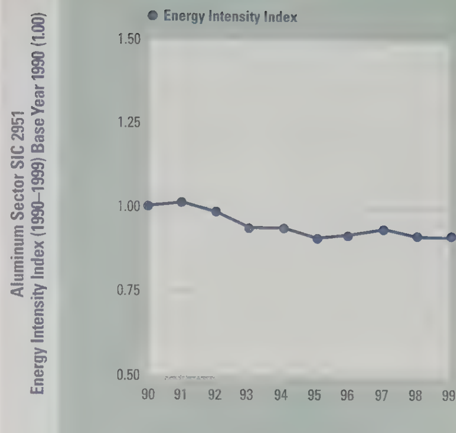
The Aluminium Association of Canada and Natural Resources Canada's Office of Energy Efficiency (OEE) have produced an energy efficiency guidebook for the aluminum sector entitled *Guide to Energy Efficiency in Aluminum Smelters*. The guide presents measures specific to melting furnaces in the aluminum sector. To obtain a free copy of the guide in English or French, fax the OEE at (613) 947-4121.

ACHIEVEMENTS For the aluminum industry, controlling anode effects, which increase energy consumption and produce GHGs, is critically important. A measurement program begun by the Canadian aluminum industry in 2000 reveals that a great deal of progress has been made. Primary aluminum production increased by 58 percent between 1990 and 1999, while GHG emissions remained stable. Over the same period, the sector reduced its GHG emissions per unit of production by more than 30 percent of carbon dioxide (CO_2) equivalent per tonne produced. Since 1990, the aluminum sector has reduced its emissions of tetrafluoroethane (CF_4) and hexafluoroethane (C_2F_6) by approximately 50 percent.

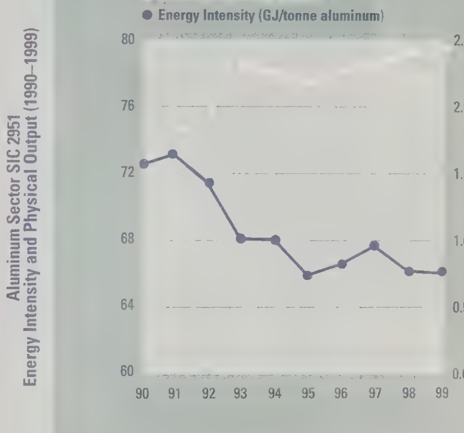
In the continuing quest for greater efficiency and better conductivity, the industry is moving to replace less efficient amorphous carbon cathode blocks with graphitized blocks. Although more expensive, graphitized blocks allow plants to boost reduction pot amperage without increasing voltage, thus producing more aluminum with each kilowatt of electricity. Several Canadian smelters operating modern prebake technology have already switched to graphitized blocks. This measure, combined with other process control improvements, enables an energy utilization factor of over 98 percent – a performance unmatched by other industries.

To further the cause of energy efficiency, the sector has established aluminum recycling as an industry-wide priority. Aluminum is fully recyclable, and turning scrap into useful metal requires only 5 percent of the energy consumed in the production of primary aluminum. Improvements in recycling rates will not only divert aluminum from the waste stream, they will also improve the sector's overall energy intensity.

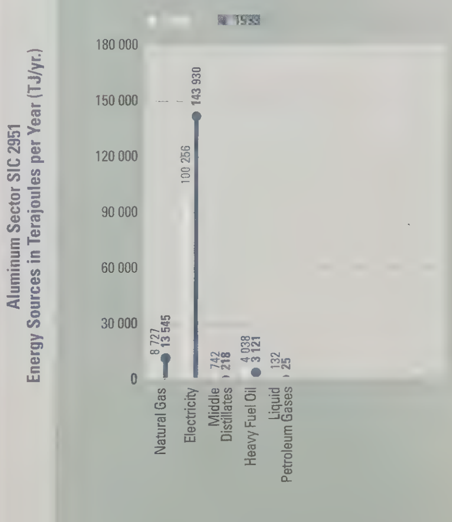
CHALLENGES While the industry will continue to make small energy efficiency gains through enhanced processes, the most significant improvements will come from the construction of new, state-of-the-art smelters. Such a transformation requires large capital investments and the availability of large quantities of electricity at highly competitive prices. Modern facilities currently account for 72 percent of total aluminum production. However, low aluminum prices combined with high energy costs will challenge the industry's ability to generate the funds needed to finance these investments. Developing workable economic models for the continued development of new facilities remains a significant industry challenge.



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre. *Development of Energy Intensity Indicators for Canadian Industry 1990–1999.* October 27, 2000, Simon Fraser University.



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre. *Development of Energy Intensity Indicators for Canadian Industry 1990–1999.* October 27, 2000, Simon Fraser University.



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre. *Development of Energy Intensity Indicators for Canadian Industry 1990–1999.* October 27, 2000, Simon Fraser University.

PROFILE: Brewing in Canada is a diverse and modern industry actively pursuing ambitious energy efficiency targets. The industry is made up of two national brewing companies, several regional brewers and numerous microbreweries. Together, these establishments – which employ nearly 17 000 workers in 76 breweries across Canada – produced about 23 million hectolitres of beer in 1999.

BREWERY

PERFORMANCE HIGHLIGHTS

- The brewery sector employs nearly 17 000 workers in 76 breweries across Canada.
- Enhanced monitoring and control equipment, maintenance and procedures have enabled brewers to identify and implement energy-saving measures.
- Despite several years of stable production, Canada's brewing industry continues to trim the amount of fuel and electricity it consumes.
- Compared to 1995, the industry has reduced its energy consumption by 5.4 percent per hectolitre of beer produced.
- The industry remains committed to an annual energy reduction of 1.0 percent over the next two years and, beginning in 2004, 1.5 percent annually through 2006.

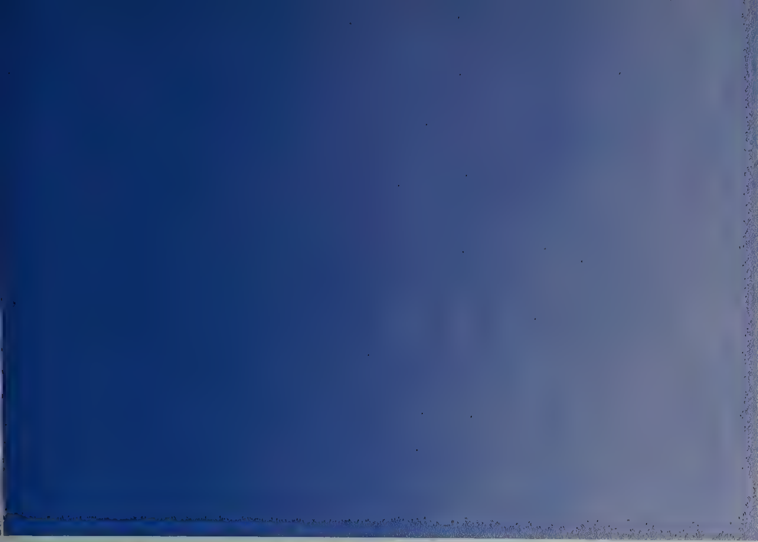
ACTIONS In 1999, Canada's brewers continued to invest in efforts to improve energy efficiency. These measures included significant capital investments, maintenance (housekeeping) improvements and energy-management initiatives. Capital investments included major upgrades to powerhouse equipment. They also encompassed improvements to beer process and packaging facilities, including the installation of power-saving variable frequency drives on electrical motors, more efficient electrical-energy conditioning equipment, energy-efficient lighting and high-efficiency boilers. Steam ejectors were replaced with energy-efficient vacuum pumps, and improved cooler doors were installed in carbonating systems.

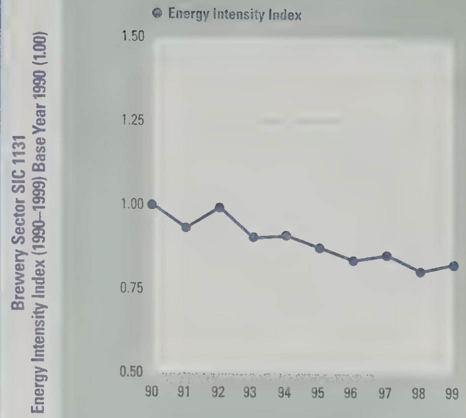
Enhanced maintenance, monitoring and control equipment procedures also have enabled brewers to identify opportunities for improvement and implement energy-saving measures. Activities included the following:

- the installation of a digital demand/consumption meter to provide instantaneous monitoring of demand/consumption rates;
- the improvement of post-run shutdown procedures to avoid energy waste;
- the upgrading of ammonia suction pressure control on refrigeration systems;
- the tuning of capacitor banks to increase the power factor;
- the reduction of lighting and the shutdown of ventilation;
- the optimization of a glycol cooler to improve heat transfer efficiency and defrosting; and
- the continuing use of an ultrasonic steam trap inspector to identify faulty traps.

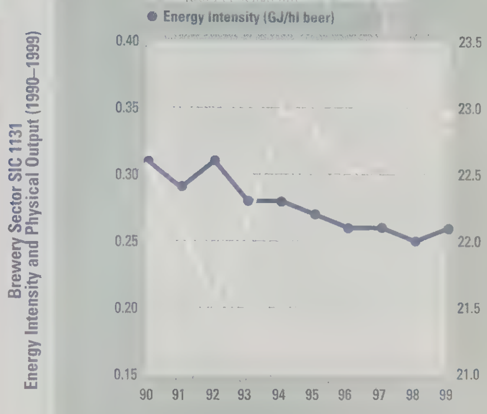
Energy audits and energy accountability help focus employees on energy waste reduction and energy conservation opportunities. Meeting on a regular basis, energy committees of managers, technical support staff and workers at the plant level have been responsible for the incremental energy improvements in all functional areas. The benchmarking of energy and water usage performance, on a company basis and among breweries internationally, helped identify best practices and opportunities to reduce energy consumption in brewing operations. Some breweries undertake powerhouse audits on a weekly basis.

Energy Efficiency Opportunities in the Canadian Brewing Industry, which was released in November 1998 with Natural Resources Canada's support, remains an excellent reference for individual energy efficiency action plans and furthers the sector's energy-reduction performance. Developed through the Brewers Association of Canada's Environment Committee, the guide highlights a vast array of energy-saving opportunities and identifies ways that energy efficiency activities can reduce costs within a brewery. The guide demonstrates the industry's commitment to the reduction of greenhouse gases in support of the Government of Canada's environmental objectives and international undertakings.





Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry 1990–1999.* October 27, 2000, Simon Fraser University.



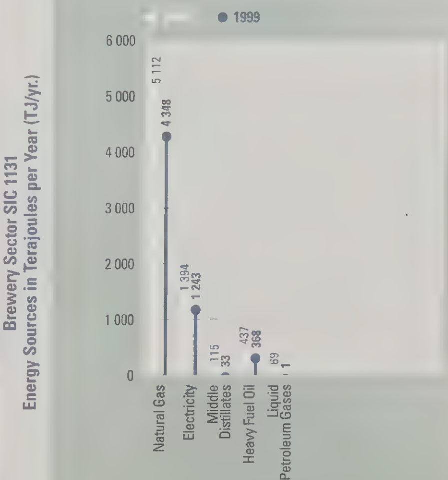
Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry 1990–1999.* October 27, 2000, Simon Fraser University.

ACHIEVEMENTS Despite several years of stable production, Canada's brewing industry continues to trim the amount of fuel and electricity it consumes. Compared to 1995, the industry now uses 5.4 percent less energy to produce a hectolitre of beer. In 1999 the industry consumed 5995 TJ of energy, 73 percent of which was natural gas, 6 percent fuel oil and 21 percent electricity.

The brewing industry is committed to an energy-reduction target of 1.0 percent per year over the next two years and, beginning in 2004, 1.5 percent annually through 2006.

CHALLENGES Cost control is a priority for the brewing industry. Flat sales since about 1975, greater competition from foreign brewers, increased competition from products such as coolers and growth in non-taxed alternatives (such as beer produced from kits and at "u-brews") have combined to weaken sales.

Brewers have responded to these challenges by developing export strategies that make Canada one of the top beer exporters in the world. Canada's brewers have also negotiated agreements that enable them to produce a number of products in Canada that would otherwise be imported. More than 400 distinct brands are now available in the Canadian market, from traditional ales and lagers to new products with varying strengths of alcohol, flavours and textures. Clearly, the industry is well positioned to meet its competition head-on. Product and marketing innovations notwithstanding, energy remains a substantial cost component in the brewing process, especially with recently escalating energy prices. Finding ways to improve energy efficiency is, therefore, a priority for Canada's brewers.



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry 1990–1999.* October 27, 2000, Simon Fraser University.

PROFILE: The cement industry is the cornerstone of Canada's domestic construction industries and a significant exporter that contributes substantially to the country's balance of payments. The industry's nine companies, which operate 16 manufacturing facilities with a combined production capacity of 12.6 million tonnes of clinker, increased their shipments by 4.5 percent in 1999.

CEMENT

PERFORMANCE HIGHLIGHTS

- The cement sector saw a 4.5-percent increase in shipments in 1999.
- Essroc Canada is planning to use scrap tires as a source of fuel, thereby reducing its coal consumption by as much as 20 percent.
- Lafarge Canada's Saint-Constant plant is now substituting 20 percent of its fossil fuel usage with scrap tires.
- An energy-saving pneumatic kiln feed system and a five-stage single string preheater at Lafarge Canada's Richmond plant uses a low-NO_2 inline calciner and downdraft calciner to ensure environmentally sound pyroprocessing.
- St. Lawrence Cement has teamed up with Algoma Steel to produce high-quality slag for use in concrete production.
- The Cement Association of Canada estimates that, by the end of 2000, total emissions associated with domestic cement consumption will be 6 percent below 1990 levels.

ACTIONS Cement manufacturers continue to implement energy efficiency projects. For example, at its Picton, Ontario, facility, Essroc Canada Inc. has established a closed-loop system which uses an on-site quarry to recycle process water. In addition, Essroc is planning to use as many as 1.6 million scrap rubber tires annually to fuel its preheater kiln, saving up to 20 000 tonnes of fossil fuels each year. When implemented, the program will divert as many as one third of the tires currently going to dumps in Ontario each year and replace up to 20 percent of the coal burned at the plant. In addition, Essroc increased feed residence times in the preheater cyclones and installed additional heat exchange chains, resulting in further fuel savings.

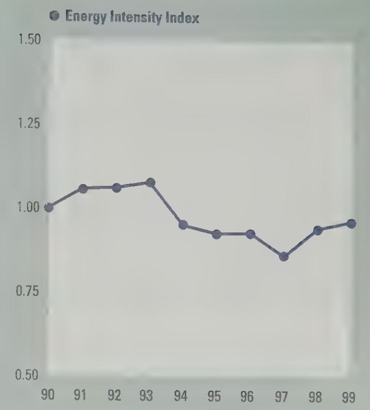
In addition to a new, energy-efficient dry kiln now in operation at Lafarge Canada Inc.'s Richmond, British Columbia, plant, the company is employing an energy-saving pneumatic kiln feed system. The system connects the blending silo to a five-stage single string preheater, which uses a low-NO_2 inline calciner and downdraft calciner to ensure environmentally sound pyroprocessing. Lafarge Canada Inc. has also commissioned a second scrap tire injector in the second kiln at its Saint-Constant, Quebec, plant, which will bring the total fuel substitution ratio to 20 percent.

St. Lawrence Cement Inc. has joined forces with Algoma Steel Inc. to open a slag granulator at Algoma's Sault Ste. Marie, Ontario, plant. Built by St. Lawrence Cement, the granulator is expected to produce 455 000 tonnes of granulated blast furnace slag each year, which St. Lawrence Cement will use as a high-quality component in its concrete. Granulated slag enables the production of easier-to-work-with, more durable concrete with a higher resistance to chemicals. The joint project provides significant environmental gains for both companies and is consistent with St. Lawrence Cement's emphasis on the use of renewable and waste sources of energy to produce its products.

The cement sector is also actively promoting energy issues through its industry association. The industry participates in the "Building Industry Table" and holds regular environmental committee meetings. The Cement Association of Canada is also actively involved in collecting information related to energy savings, emissions and the energy-efficient application of its products.

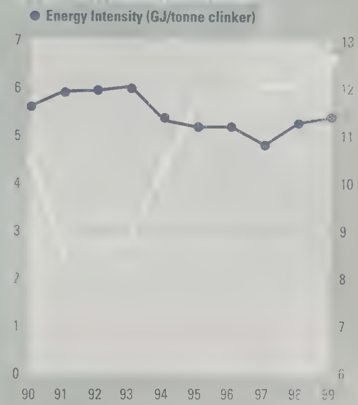
ACHIEVEMENTS Canada's cement sector has reduced it fuel consumption by an impressive 30 percent per tonne since the mid-1970s, principally by implementing major process improvements. The Cement Association of Canada estimates that, by the end of 2000, total emissions associated with domestic cement consumption will be 6 percent below 1990 levels. This projection is based on an estimated 12-percent increase in domestic consumption between 1997 and 2000. Associated emissions per tonne of concrete product should show a 14-percent decrease in CO_2 compared with 1990.

Cement Sector SIC 3521
Energy Intensity Index (1990–1999) Base Year 1990 (1.00)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–1999.* January 2001. Simon Fraser University.

Cement Sector SIC 3521
Energy Intensity and Physical Output (1990–1999)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–1999.* January 2001.

The principal energy sources used for cement production are coal, natural gas and petroleum coke. In 1999, the use of alternative fuels (tires, wood waste, used oils and waste fuel) increased to 6003 terajoules, or 8.8 percent of total energy used. Manufacturers continue to improve environmental performance through the use of waste materials and fuels in the production process.

Since 1990, the cement sector has managed to reduce its combined energy intensity by 4 percent, despite a production increase of more than 20 percent. The expanded use of power monitoring, targeting and other systems and technologies will combine with plant modernizations to further energy efficiency improvements within the sector.

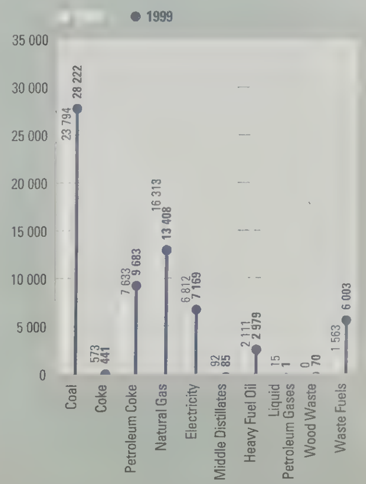
CHALLENGES The cement sector is currently reconstituting its CIPEC Task Force, thereby delaying joint progress toward sectoral goals. Moreover, since energy consumption is a competitive issue, sector companies treat energy cost reduction information as confidential, inhibiting broad information sharing. Energy is a substantial cost component in the production of cement, and energy efficiency gains can improve a company's competitive position in the marketplace.

The cement sector's energy intensity target is an improvement of 0.5 percent per year through the year 2000. Reaching this goal depends on continued strong demand for the industry's products, along with the acceptance of standard methods for measuring waste fuel efficiencies and energy embodied in its exports.

These conditions are far from assured. For example, long-standing discussions among waste producers and waste users have not yet yielded an appropriate methodology to establish emissions-related credits for waste material use in the production of cement. Similarly, complex international negotiations continue to delay the establishment of standardized accounting methods for energy embodied in cement exports. Moreover, the potential implementation of economic instruments such as a "carbon tax" could seriously impair Canada's cement exports.

Many cement producers would gladly expand the use of waste materials such as discarded tires as fuel. However, low landfill fees for discarded tires in many jurisdictions inhibit such use. Despite the obstacles, the industry continues to promote concrete as an energy-efficient product and to make cement and concrete the materials of choice for environmentally responsible industries. It is also continuing to develop an appropriate methodology for life-cycle assessment of cement-based materials and products.

Cement Sector SIC 3521
Energy Sources in Terajoules per Year (TJ/yr.)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–1999.* January 2001. Simon Fraser University.

PROFILE: ***The chemical sector is a diverse industry producing organic and inorganic chemicals, as well as plastics and synthetic resins. Companies in this sector operate 775 facilities Canada-wide, directly employing more than 24 000 people with an annual payroll of $1.3 billion.***

CHEMICAL

PERFORMANCE HIGHLIGHTS

- The chemical sector operates 775 facilities Canada-wide, directly employing more than 24 000 people.
- NOVA Chemicals' new Joffre cogeneration plant now produces 4 percent of Alberta's electrical power.
- An N_2O abatement facility at DuPont's Maitland, Ontario, site has exceeded target performance for 1999, generating a CO_2 reduction of 10.3 million tonnes.
- Sterling Pulp has slashed oil consumption by 88 percent at its Buckingham, Quebec, facility by recovering and using waste hydrogen.
- The global warming potential per unit of output in the sector has decreased by 50 percent.

ACTIONS The chemical sector continued to take bold action to improve energy efficiency in 1999. A major component in the sector's ability to improve performance is cogeneration. In aggregate, Canadian Chemical Producers' Association (CCPA) members accounting for 82 percent of the sector's CO_2 emissions are now meeting 49 percent of electricity and 44 percent of steam requirements through cogeneration. By 2010, cogeneration is expected to account for 78 percent of electricity and 67 percent of steam required.

All CCPA member companies must subscribe to the association's Responsible Care® initiative. Responsible Care establishes guiding principles and codes of practice covering all aspects of the chemical life cycle, including the requirement that each member report annually on the emissions of as many as 500 substances.

Individual manufacturers have taken noteworthy action in 1999. Following are some examples.

At the company's St. Clair River and Moore Township plants in Ontario, NOVA Chemicals Corporation has upgraded processes, reduced bottlenecks and minimized downtime as part of its 10-year Total Energy Reduction Program. The plants reduced line restrictions by replacing control valves with variable frequency drivers on some pumps, increased line sizes and reduced pressures to increase system flow rates. A new vessel cut steam use while an increased reactor length on one line led to a large improvement in product output. Employees worked together to minimize downtime and keep the processes running. The efforts paid off. Energy use was cut by 27 percent at the St. Clair River plant and by 32 percent at the Moore facility. Since 1990, the two plants have cut annual energy use by the equivalent of 2.5 million gallons of gasoline.

At its Joffre, Alberta, plant, NOVA Chemicals' new cogeneration power plant is now in operation. The $380-million plant supplies the electrical needs of the newly expanded plant and provides approximately 330 megawatts of excess power to the Alberta Interconnected System. A partnership with ATCO Power, the plant increases the amount of energy generated in Alberta by more than 4 percent.

In Buckingham, Quebec, Sterling Pulp Chemicals Ltd. has begun to capture waste hydrogen from its processing for use as a fuel. Sterling Pulp has invested more than $800,000 in the hydrogen project, which has enabled the company to replace oil with a clean-burning, greenhouse gas (GHG) free alternative in the production of sodium chlorate and sodium chlorite. By capturing and using hydrogen, Sterling Pulp has slashed oil consumption from 6.9 million litres in 1995 to 0.9 million litres in 1999, an 88-percent reduction in fossil fuel use. Moreover, compared to 1998, CO_2 emissions from the site have been cut by 70 percent, and oxides of nitrogen and sulphur emissions have been reduced.

A nitrous oxide (N_2O) abatement facility at the Maitland, Ontario, site of DuPont Canada Inc. has exceeded target performance for 1999, thereby accelerating the rate of improvement of this new technology since its launch in 1997. The facility's exceptional performance has led to actual N_2O abatement of 85.5 percent in 1999 compared to a target of 75.0 percent. The improvement is equivalent to a CO_2 reduction of 10.3 million tonnes.

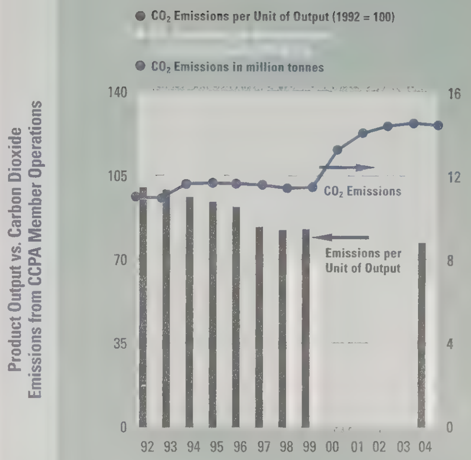
ACHIEVEMENTS In 1999 the chemical sector's energy consumption totalled 218 427 TJ, a 22-percent increase over 1992 levels. However, the constant dollar value of the industry's products, used as a measure of output, increased 26 percent over the same period and 1 percent from 1998 to 1999. During the same period, CO_2 emissions levels increased 4.6 percent, and CO_2 emissions per unit of output decreased 17 percent. Total GHG emissions in 1999, expressed as CO_2 equivalents, decreased 37 percent from 1992 levels. GHG emissions per unit of output decreased 50 percent. The CCPA estimates that, in 2004, CO_2 and GHG emissions per unit of output will be 33 percent and 58 percent, respectively, lower than 1992 emissions.

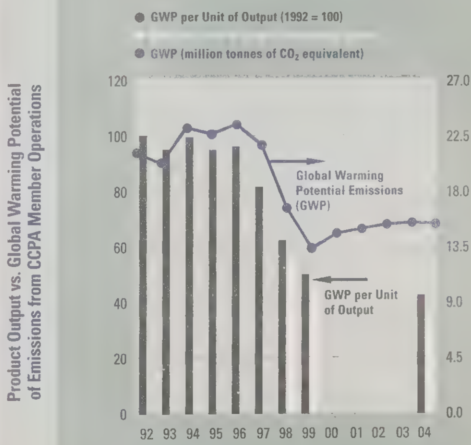
In 1999, CCPA established the world's first protocol for re-verification of Responsible Care companies. Responsible Care is an industry-wide program aimed at continuing improvement in the industry's environmental performance. Although the new protocol was put into place in June 1999, by year-end five companies completed their re-verifications with another 20 or more underway. Late in 2000, CCPA's exceptional commitment to environmental issues through Responsible Care earned the association Gold Level Champion Reporter status from Canada's Climate Change Voluntary Challenge and Registry Inc. (VCR Inc.) for its action plan to reduce GHG emissions.

Under Responsible Care, all top CO_2 emitters are expected to register with VCR Inc. In aggregate, these members account for over 90 percent of all CO_2 emitted by CCPA members. For more information about climate change and the chemical industry, visit the CCPA Web site at www.ccpa.ca.

CHALLENGES Obtaining accurate information remains an issue for the chemical sector. The creation of data is complicated by the chemical industry's use of natural gas and petroleum distillates as feedstock as well as fuel. To ensure accurate and consistent reporting of energy consumption, the CCPA is working with several government agencies on ways to improve the sector's energy consumption measurement and reporting.

Continued growth in the chemical industry makes it likely that, while CO_2 emissions per unit of output will continue to improve, total CO_2 emissions will grow. The dramatic changes already made through application of cogeneration and nitrous oxide abatement technologies will be difficult to replicate. However, the globally competitive nature of the chemical industry will maintain the incentive to continually improve energy efficiency.





Footnotes:

1. Chemical output and emission forecasts take into account announced capacity increases.
2. Historical output was calculated using constant 1992 dollars, taking into account average chemical pricing changes.

PROFILE: ***Canada's dairy product manufacturing sector spans the country from coast to coast. Employing 20 500 people in more than 270 facilities, Canada's dairies processed more than 73 million hectolitres of raw milk and shipped an estimated $8.6 billion worth of milk products in 1999.***

DAIRY

PERFORMANCE HIGHLIGHTS

- Canada's dairies shipped products worth an estimated $8.6 billion in 1999.
- Dairies have implemented dozens of energy-saving process improvements, from thermal storage of recovered hot water to exterior tanker recycled water washes, lighting upgrades and improved control of air and water leakage.
- Dairies employ electrical, thermal and water-based energy systems in their facilities.
- Agropur Coopérative Agro-Alimentaire uses energy-saving anaerobic technology for treating waste-water at its cheddar cheese facility.
- Foothills Creamery has installed high-efficiency lighting and ballasts along with motion sensors in its plant.
- The National Dairy Council of Canada released its study, *Energy Performance Indicator Report – Fluid Milk Plants.*
- In 1999, the sector's total energy consumption was 12 846 TJ, up slightly from the 1990 level of 11 952 TJ.
- The sector's energy intensity is increasing due to consumer demand for products which require more energy to produce.

ACTIONS Energy is a key component in milk processing. Typically, dairies employ electrical, thermal and water-based energy systems in their facilities for such processes as pasteurization, churning, washing, packaging, cooling, freezing and drying. The importance of energy to the sector has led the National Dairy Council of Canada to promote industry-wide participation in energy efficiency efforts.

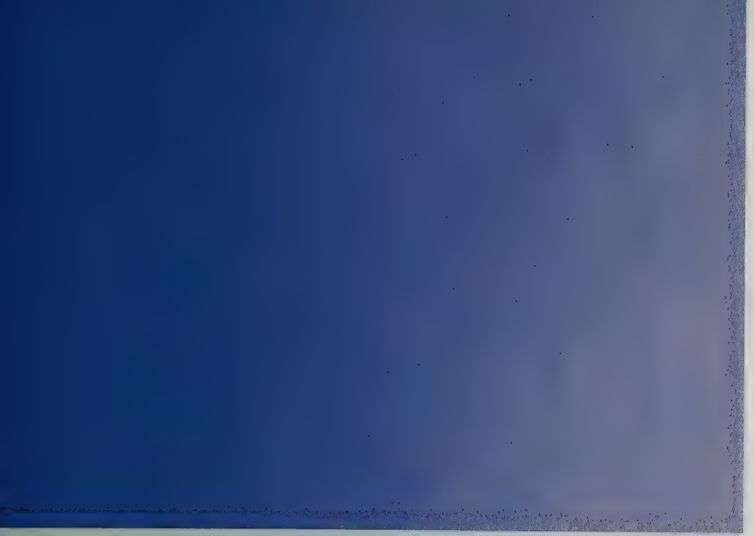
The Council encourages each dairy industry subsector to implement low-cost, no-cost and retrofit improvements throughout their plant operations. Dairies have implemented dozens of energy-saving process improvements, from the thermal storage of recovered hot water to exterior tanker recycled water washes, lighting upgrades and improved control of air and water leakage.

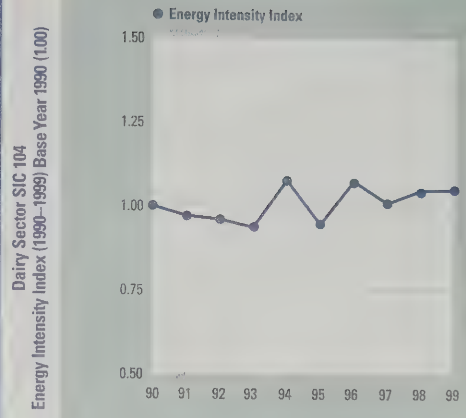
For example, Agropur Coopérative Agro-Alimentaire's cheddar cheese facility in Notre-Dame-du-Bon-Conseil, Quebec, uses leading-edge technological innovations to foster energy efficiency in its waste-water treatment plant. The plant uses an anaerobic treatment system which saves $100,000 in annual energy costs, cuts sludge by 90 percent and generates about $50,000 in usable methane. The company recently installed a Sequential Batch Reactor (SBR), saving 30 percent on energy used for lagoon aeration, and added a high-efficiency air diffuser.

Foothills Creamery Ltd., in Edmonton, Alberta, has installed high-efficiency lighting and ballasts throughout its plant, adding motion sensors in its warehouse, cooler and freezer areas. The sensors shut off lighting when the areas are not in use. The lighting retrofit is saving the company more than $11,000 per year and is delivering a return on investment of 58 percent.

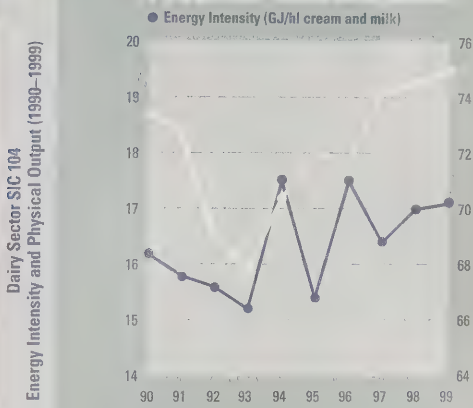
The Dairy Sector Task Force provides companies seeking to make such improvements with information on expected cost savings and payback periods. Moreover, the National Dairy Council of Canada, in partnership with Natural Resources Canada, supports the energy efficiency achievements of dairy plant managers through research and educational materials.

In 2000, the National Dairy Council of Canada released a study entitled *Energy Performance Indicator Report – Fluid Milk Plants.* The study develops benchmarks for energy efficiency in Canadian fluid milk plants and establishes a methodology appropriate for examining plant energy performance. The study also reviews potential energy-saving ideas appropriate for the milk processing industry.

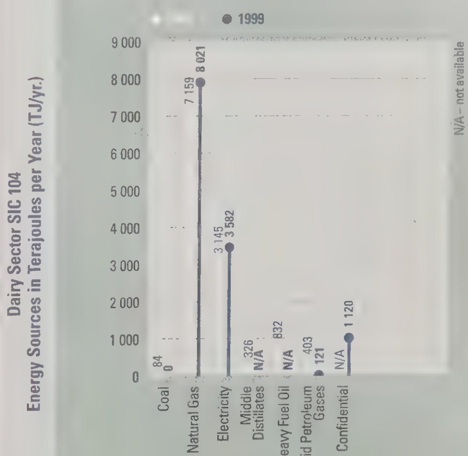




Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–1999.* October 27, 2000, Simon Fraser University.



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–1999.* October 27, 2000, Simon Fraser University.



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–1999.* October 27, 2000, Simon Fraser University.

ACHIEVEMENTS The dairy sector has made significant progress toward lowering its costs through improved energy efficiency. In 1999, the dairy product manufacturing sector's total energy consumption was 12 846 TJ, up slightly from the 1990 level of 11 952 TJ. The amount of milk and cream produced in 1999 is also up from 1990 levels. Except for a peak year in 1994, energy intensity remained at or below the 1990 level until 1996 when consumer demand for more energy-intensive products from the industry offset the sector's progress in improving energy efficiency.

CHALLENGES With rapidly rising energy prices and limited availability of capital, improving energy efficiency is a significant challenge for dairy product manufacturers. In addition, rationalization and competitive pressures continue to drive the industry to reduce excess capacity in the face of static sales.

While the sector's main source of raw milk is highly regulated, the marketplace demands that dairy product companies provide innovative, high-quality, value-added products at the best possible prices. Unfortunately, creating the products consumers want often conflicts with efforts to improve energy efficiency. For example, producing increasingly popular extended-shelf-life products requires ultra-high-temperature pasteurization and other processes which use significantly more energy per unit of output.

Manufacturers have already made the most of the low-cost and no-cost energy efficiency improvements available to them. Their greatest challenge going forward is to make the more costly, payback-delayed improvements which will further advance energy efficiency.

PROFILE: The electrical and electronics sector includes a diverse array of companies that produce electrical appliances, lighting, consumer electronics, communications and electronic equipment, cabling, office equipment, industrial equipment and other electrical products. These companies operate more than 1400 facilities employing over 119 600 workers across Canada. The industry is a major exporter and a vital, growing contributor to the national economy.

ELECTRICAL AND ELECTRONICS

PERFORMANCE HIGHLIGHTS

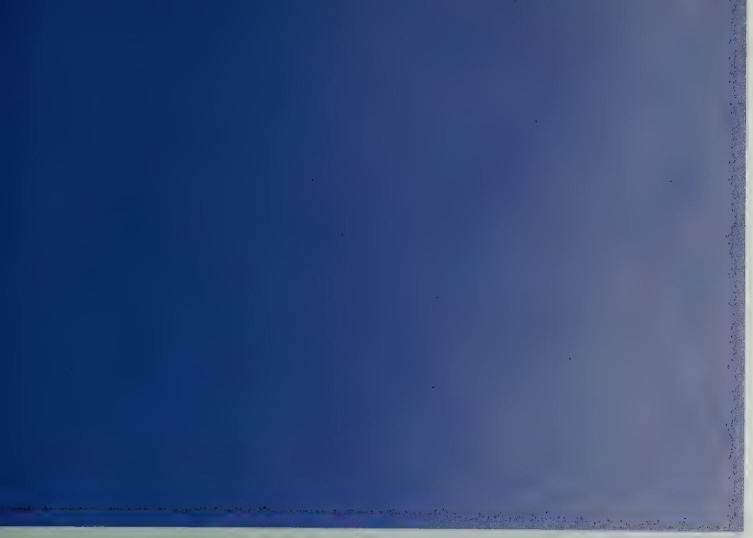
- The electrical and electronics sector is Canada's least energy-intensive industry.
- IBM Canada initiated 18 separate energy-conservation projects in 1999/2000.
- Honeywell employees who do not need a permanent office location are being encouraged to work from home offices.
- Ascolectric Ltd. installed a closed-loop cooling system, enabling the company to cut water use by two thirds.
- Average energy expenditures are less than 1 percent of the value of the industry's shipments, compared with more than 61 percent for materials and supplies and 16 percent for labour.
- Between 1990 and the end of 1999, the sector's energy consumption remained relatively constant despite substantial growth in production.
- The industry projects a decrease of one third in energy consumption over the next decade, ahead of its Kyoto commitments.
- Many sector manufacturers make a significant contribution to decreasing CO_2 emissions by increasing the energy efficiency of the products they manufacture and sell.

ACTIONS Although the electrical and electronics sector is one of Canada's least energy-intensive industries, many corporations remain committed to environmental programs and sustainable development and continue to include energy efficiency as a vital component of their efforts to control costs. Following are some examples.

By the end of 2000, IBM Canada Ltd. initiated 18 separate energy-conservation projects, as well as the systematic rationalization of IBM mainframe computer technology. from water-cooled processors to new air-cooled CMOS machines. At the company's National Distribution Centre in Markham, Ontario, IBM implemented initiatives to eliminate the conveyor system, reduce compressor use and delamp high-intensity discharge (HID) lights in double-lit areas in the warehouse. The company installed lighting timers and automatic curtains for a controlled-humidity environment and retrofitted steam electrode humidifiers for warehouse unit heaters to ultrasonic electric humidifiers and programmable thermostats. IBM conducted a lamp and ballast retrofit in its office tower and warehouse offices, installed a programmable low-voltage lighting-control system with zonal control in warehouse modules and fitted occupancy sensors in small rooms, meeting rooms, washrooms and high-bay warehouse buildings. The company established new building automation system monitoring points and even enhanced the efficiency of the vending machines through the installation of power optimization controllers.

Honeywell Limited has a 15-percent energy-reduction target. The company's Scarborough, Ontario, Manufacturing Operations and its Vancouver, British Columbia, Honeywell-Measurex facility, have identified opportunities to reduce energy consumption by installing improved heating, ventilating and air-conditioning (HVAC) controls and lighting controllers to turn off lights when buildings are unoccupied. Modification helped the Scarborough facility to achieve a 6-percent energy reduction in 1999 over 1998. To further reduce company-wide energy usage, many under-utilized offices are being closed and people relocated to newer, more energy-efficient buildings. Employees who do not need a permanent office location, such as sales and field operations people, are being encouraged to create home offices as a basis of operations.

Ascolectric Ltd. installed a closed-loop cooling system, enabling the company to cut water use by two thirds at its Brantford, Ontario, facility. Ascolectric is always looking for ways to increase efficiency. The company insulated plant windows with plastic barriers that keep the heat out in summer and the cold out in winter. The plant installed buffers in its shipping and receiving doors to reduce leaks and drafts when trucks load and unload. The company has seen a decrease in natural gas consumption with the introduction of these simple energy initiatives.



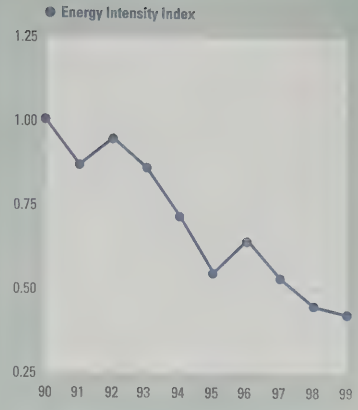
ACHIEVEMENTS Between 1990 and 1999, the electrical and electronics sector's gross domestic product (GDP) increased by 57.8 percent. In 1999, the industry consumed 18 367 TJ of energy, representing 0.71 percent of the energy consumed by the manufacturing sector as a whole, and 0.53 percent of total energy-related manufacturing CO_2 emissions. On average, expenditures on energy are equivalent to less than 1 percent of the value of the industry's shipments, compared with more than 61 percent for materials and supplies and 16 percent for labour. Natural gas and electricity satisfy virtually all of the industry's energy requirements.

Between 1990 and the end of 1999, the sector's energy consumption remained relatively constant despite substantial growth in production. These factors have combined to decrease energy intensity by 57.85 percent. The consolidation of manufacturing operations and distribution channels (through acquisitions and mergers) is bringing the industry increased efficiencies of scale, which could lead to a projected decrease in energy consumption of one third over the next decade. Despite the challenges it faces, the electrical and electronics sector is ahead of its Kyoto commitment.

Many of the sector's manufacturers make a significant contribution to decreasing CO_2 emissions through the products they manufacture and sell. Products ranging from oil refinery control systems to high-efficiency motors and lighting are used directly by other companies to decrease their energy consumption.

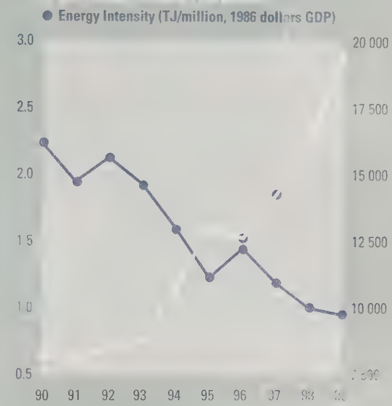
CHALLENGES Because the electrical and electronics sector is not energy intensive, many manufacturers consider greenhouse gas (GHG) emissions and energy efficiency less critical to the industry's health than technological change, market growth and sales and distribution issues. Manufacturers often fear that unilateral Canadian actions to reduce GHG emissions in response to the Kyoto commitment place their plants at a competitive disadvantage with foreign-based competitors with fewer environmental constraints. To most companies, with a primary focus on the next two fiscal quarters, a commitment to long-term targets appears unrealistic.

Electrical and Electronics Sector SIC 33
Energy Intensity Index (1990–1999) Base Year 1990 (1.00)



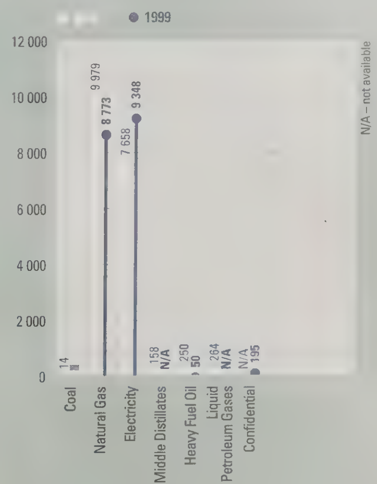
Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–1999.* October 27, 2000, Simon Fraser University.

Electrical and Electronics Sector SIC 33
Energy Intensity and Economic Output (1990–1999)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–1999* October 27, 2000, Simon Fraser University.

Electrical and Electronics Sector SIC 33
Energy Sources in Terajoules per Year (TJ/yr.)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–1999.* October 27, 2000, Simon Fraser University.

PROFILE: ***Canada's fertilizer industry is one of the world's major producers and exporters of nitrogen, potash and sulphur fertilizers, manufacturing 12 percent of the world's total fertilizer materials. Companies in this sector operate more than 30 production facilities.***

FERTILIZER

PERFORMANCE HIGHLIGHTS

- Canada's fertilizer industry is one of the world's major producers and exporters of nitrogen, potash and sulphur fertilizers.
- The Canadian industry is among the most energy efficient compared with its global competitors.
- The Canadian Fertilizer Institute and its partners are conducting research on GHG emissions from agroecosystems using varying applications of fertilizer.
- The industry's domestic agriculture sales total about $2 billion annually, supporting a network of more than 1500 distributors and retailers across the country.
- Total Canadian shipments are approximately 24 million tonnes, valued at approximately $5.5 billion.
- Nitrogen fertilizer production increased from 6.8 million tonnes in 1990 to 10.3 million tonnes in 1999.

ACTIONS The Fertilizer Sector Task Force continues to develop baseline information on the sector's energy use and to resolve data issues surrounding the use of natural gas as a feedstock in the production of nitrogen fertilizers. This process will enable the sector to better measure energy-use patterns and monitor energy efficiency improvements. In addition, the Canadian Fertilizer Institute (CFI) in partnership with Agriculture and Agri-Food Canada and the University of Manitoba are conducting research to determine greenhouse gas (GHG) emissions from agroecosystems under varying regimes of nitrogenous fertilizer application.

While fertilizer manufacturers regard information on their specific energy efficiency activities as confidential, it is clear that the Canadian fertilizer industry is among the most energy efficient in the world. Moreover, economic and environmental factors are leading companies in the sector to continue to develop and employ energy-efficient new technologies. The intensifying international focus on climate change provides additional impetus to improve energy intensity and limit GHG emissions.

ACHIEVEMENTS Canada's fertilizer industry records total annual shipments of approximately 24 million tonnes, valued at about $5.5 billion. More than 75 percent of these shipments are exported, with two thirds of exports to U.S. farmers. Domestically, agriculture sales total about $2 billion annually. The manufacture, distribution and sales of fertilizer products employ about 12 000 people from coast to coast, including a nationwide domestic network that exceeds 1500 distributors and retailers.

Canadian fertilizer manufacturers are acknowledged world leaders in sectoral energy efficiency and emissions control. The industry's success in reducing energy intensity is a major factor in its ability to remain internationally competitive.

Fertilizer production is energy intensive, making energy efficiency a key industry priority. Most of the natural gas consumed by the sector is used as a feedstock to generate hydrogen, an essential ingredient in the production of ammonia. Production efficiency, particularly of nitrogenous fertilizers, has improved over the last 10 years. When natural gas consumption rises, as it has in recent years, it largely reflects increases in the volume of fertilizer produced and exported.

Since 1990, potash production has increased 19.18 percent for a total of 8 329 890 tonnes in 1999. Based on Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC) data, over the same period energy consumption by potash producers has risen, but the energy component per tonne has declined from 3.92 GJ per tonne in 1990 to 3.89 GJ per tonne of output in 1999. Overall, energy indicators show an improvement in energy intensity that averages more than 1 percent per year since 1990.

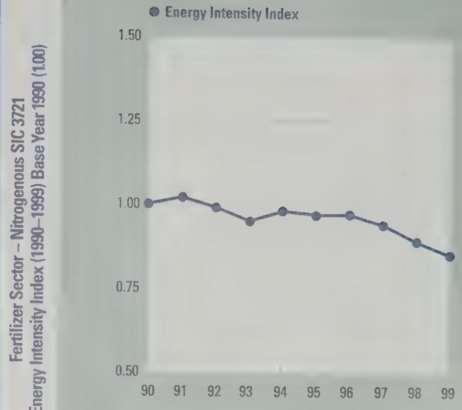
According to CIEEDAC, nitrogen fertilizer production increased from 5.44 million tonnes in 1990 to 5 941 613 tonnes in 1999, while the Fertilizer Sector Task Force database shows production totals of 6 815 742 tonnes for 1990 and 10 267 296 tonnes for 1999. Similarly, the CFI reports 1999 natural gas consumption at 46 452 TJ versus 37 192 TJ in 1990. Other energy consumed was 6108 TJ in 1999, compared with 3830 TJ in 1990. CFI numbers have been used for natural gas consumption, because the task force believes that CIEEDAC surveys may include natural gas used as a feedstock (normally about 70 percent of the natural gas consumed in ammonia production) in its energy consumption data. The 1999 figures prepared by the task force, and accepted by Natural Resources Canada, show energy intensity and production based on a data quality analysis conducted to reconcile these differences.

(Note: The figures used for the graphs in this section are derived from data developed by CIPEC's task force for nitrogenous fertilizers only.)

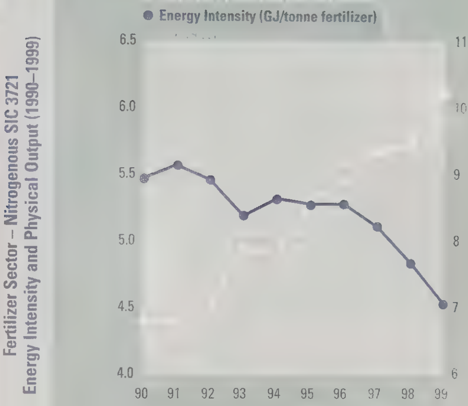
CHALLENGES Fertilizers play an important role in maintaining and restoring atmospheric health. Just as animals, humans and human technological activities consume oxygen and release CO_2, plants absorb CO_2 and release oxygen. When in harmony, these forces create a stable, but delicate, balance of gases in the atmosphere. By increasing the plant biomass that absorbs CO_2 and produces oxygen, fertilizers help to reinforce the natural balance. Recognizing the important environmental role the industry plays, the CFI has embarked on collaborative research to identify agricultural practices that maximize CO_2 removal from the atmosphere.

The fertilizer industry faces a significant global challenge. Rapid world population growth combined with limited and diminishing productive crop land is taxing humanity's ability to produce enough food to improve the diets of a growing worldwide population. For the agricultural industry to sustain and boost its production, high-yield practices must be embraced. Consequently, the fertilizer industry must be prepared to make a vital contribution to the sustainability of global food production by focusing on the responsible production and use of fertilizer to nourish the world's soil.

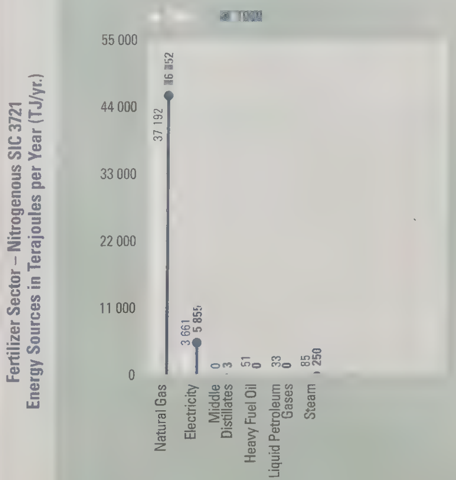
This challenge has been made more complex by the impact of rising world energy prices. Towards the end of 2000, dramatic increases in the price of natural gas contributed to substantially reduced production of nitrogenous fertilizers throughout North America, a trend that may threaten food production in the coming years.



Data source: Canadian Fertilizer Institute (CFI), February 15, 2001



Data source: CFI, February 2001.



Data source:
(1) "Natural gas 1990–1999." CFI, 2001.
(2) "Other fuels 1990–1999." Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–1999*, January 2001, Simon Fraser University.

PROFILE ***Canada's food processing sector includes manufacturers producing a diverse range of products, including meat, poultry, fruit and vegetables, flour and bakery products, oils and sugars, coffee, snack foods, soft drinks and confections.***

FOOD PROCESSING

PERFORMANCE HIGHLIGHTS

- In 2000, the Baking Association of Canada, the Canadian Council of Grocery Distributors, the Canadian Meat Council and the Alberta Food Processors Association signed letters of co-operation with CIPEC.
- Companies within the food processing industry addressed energy peak costs by making power factor corrections, sizing motors to match demands and sequencing the start-up of heavy equipment.
- Unilever adopted an "energy wise" program where the company offers to cover the cost of energy efficiency audits of its employees' homes.
- Targets for energy efficiency goals in the food processing sector were set, after polling member companies.
- The industry recorded an energy intensity improvement in 1999 of approximately 6.39 percent compared with 1990.

ACTIONS The Food Processing Task Force, supported by the Food and Consumer Products Manufacturers of Canada (FCPMC), continued to broaden its membership and increase awareness of energy issues within the industry during the 1999/2000 year. The FCPMC represents over 180 Canadian-operated member companies that manufacture and market a wide array of food and consumer products. The industry currently generates over $18 billion annually in GDP (13.4 percent of the manufacturing GDP) and employs 250 000 Canadians directly in every region in Canada. In addition, the bakery industry includes more than 10 000 establishments.

In the 1999/2000 year, the sector appointed Tim Moore of The Clorox Company of Canada Ltd. as its "CEO Champion," and member companies were canvassed to set energy intensity reduction targets covering the next 10 years.

The sector held customized monitoring and tracking workshops in February 2000 and a workshop on identifying energy-savings opportunities, adapted for the food industry, in November 2000. The Alberta Food Processors' Association, a recent CIPEC signatory, commissioned a report and two workshops on "How to Improve Your Business Sustainability and Profits by Reducing Greenhouse Gas Emissions" as part of a program to reduce greenhouse gases (GHGs) by 25 percent at 18 facilities in Alberta.

Companies within the food processing industry addressed energy-peak costs by making power factor corrections, sizing motors to match demands and sequencing the start-up of heavy equipment. The industry is showing a growing interest in energy audits to help define potential energy savings. This interest grows proportionately with increases in energy prices.

Individual members continue to invest in energy efficiency. Following are some examples.

Unilever Canada Limited adopted an "energy wise" program where the company subsidized the cost of energy efficiency audits and energy retrofits at its employees' homes.

Niagara Country Fresh Poultry of West Lincoln, Ontario, has introduced a program to improve the efficiency of its water and waste-water systems.

DC Food Processing, a division of HMR Foods Partnership, Waterloo, Ontario, launched an electrical efficiency project which incorporates monitoring and tracking systems to enable the company to achieve energy savings by controlling air movement through temperature-controlled spaces.

Kraft Canada Inc. reports that its total energy consumption in 1999 was 10.2 percent below 1994 levels, 1994 being the year in which the company began tracking energy consumption data.

Maple Leaf Pork installed a direct contact hot water heater at its Burlington, Ontario, pork processing plant. The heater, which replaced a conventional steam system, will reduce the fuel used per unit of water heated by 25 percent.

New Brunswick's Connors Bros. Limited, a subsidiary of George Weston Limited, has been committed to energy efficiency for more than two decades. For the last three years, the sardine cannery has been converting to energy-efficient lighting throughout the facility. The plant has also slashed its freshwater use by pumping in seawater to assist in air conditioning.

Maple Leaf Consumer Foods has recently installed blowdown heat recovery and vent condensing systems at its Winnipeg, Manitoba, plant, saving the company more than $32,000 per year on fuel, water and boiler chemicals.

Casco Inc. is one of only four Ontario businesses to win a Platinum Business Award for outstanding waste-reduction efforts. Casco's Cardinal corn wet-milling operation annually diverts about 97 percent of its waste away from landfill.

ACHIEVEMENTS Recent energy price increases in natural gas (the sector's main fossil fuel) and the looming electrical deregulation in Ontario have led many food companies to take a fresh look at energy projects which were previously shelved. Higher energy costs have improved the pay-back equations of many energy projects competing with other activities for capital investment funds. Off-book financing and performance contracting for energy-related activities have also attracted rising interest over the past year.

The Food Processing Sector Task Force continued to build its base of support in 2000. Letters of co-operation were signed by the Baking Association of Canada, the Alberta Food Processors Association, the Canadian Meat Council and the Canadian Council for Grocery Distributors. The Fisheries Council of Canada is also considering joining the Food Processing Task Force.

Bringing these associations into the fold means that a major portion of food industry energy users across Canada will be able to benefit from the support services available – through CIPEC – from Natural Resources Canada's Office of Energy Efficiency. Currently, food processors in Alberta are participating in CIPEC activities through the western Canada General Manufacturing Task Force, while opportunities exist in eastern Canada for food industry activities to draw participation from other sectors. Such cross-sectoral efforts are helping to extend CIPEC's reach to companies across all regions of Canada.

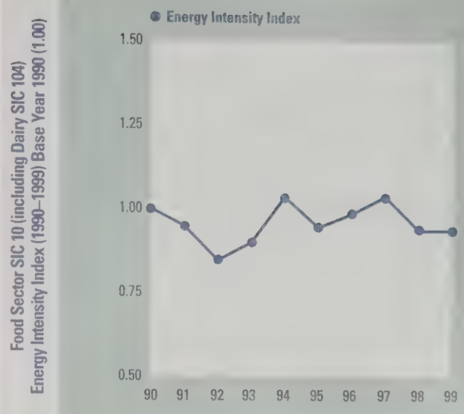
The food processing sector's energy consumption approached 93 092 TJ in 1999, up from 85 608 TJ in 1990. Since 1990, use of electricity and steam in the food processing sector has increased, while use of heavy fuel oil has declined. In general, the industry recorded an energy intensity improvement in 1999 of approximately 6.39 percent compared with 1990.

Targets for energy efficiency goals for the food and consumer products industries were set, after polling member companies. For the years 2000–2005, the sector anticipates an average reduction in energy use of 2.2 percent per year. From 2006 to 2010, the sector's goal is an average reduction of 1.7 percent per year, for a total of 19.5 percent over the next 10 years.

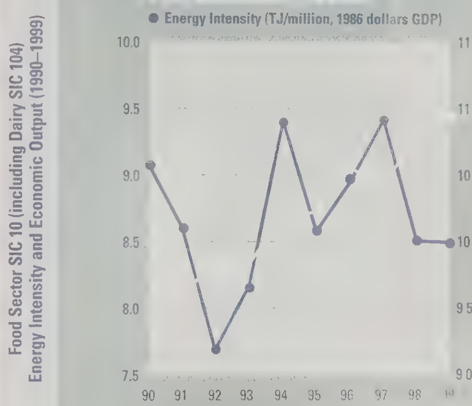
The food processing sector continues to operate under the CIPEC umbrella and to abide by industrial targets set for the sector. Data collected under CIPEC have been forwarded to Agriculture and Agri-Food Canada to support its National Climate Change Issue Table efforts.

CHALLENGES Energy intensity reductions in the food industry continue to improve as companies produce at near optimal capacity. The true measure of energy intensity reduction efforts will be found if the sector's production and exports slow down.

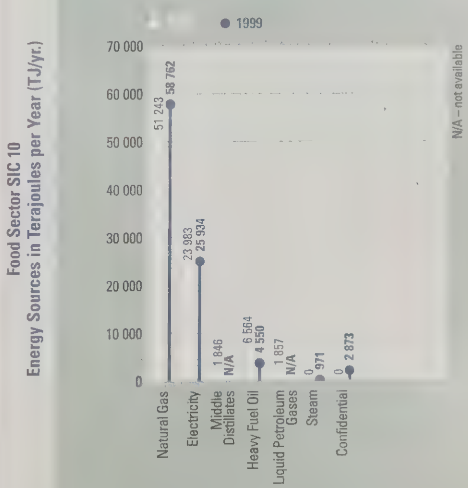
Compared to other environmental issues such as solid waste disposal and water contamination, energy consumption is nearly invisible to many operators. The sector's challenge is to make management and employees aware that energy is a costly raw material that can be managed for maximum efficiency, not a fixed overhead necessary to maintain comfort levels. As energy prices continue to rise, the industry will be challenged to find new ways to reduce this significant component of food production costs.



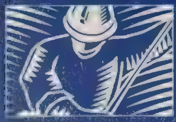
Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–1999.* October 27, 2000, Simon Fraser University.
Note: Includes data for Dairy Sector (SIC 104).



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–1999* October 27, 2000, Simon Fraser University
Note: Includes data for Dairy Sector (SIC 104).



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–1999.* October 27, 2000, Simon Fraser University.
Note: Includes data for Dairy Sector (SIC 104).



PROFILE: A high percentage of all manufactured goods depends either directly or indirectly on the castings produced by Canada's foundry industry. Industries relying on castings include the automotive sector, construction, agriculture, forestry, mining, pulp and paper, heavy industrial machinery and equipment, aircraft and aerospace, plumbing, soil pipe, municipal road castings, defence, railway, petrochemical, electric distribution and a myriad of specialty markets. There are approximately 200 foundries in Canada, employing 15 000 people and generating annual sales of $2 billion. About 80 percent of the foundry sector's production is exported.

FOUNDRY

PERFORMANCE HIGHLIGHTS

- Canada's 200 foundries employ 15 000 people and generate annual sales of over $2 billion.
- ESCO's power-monitoring program has cut electricity costs by $60,000 per month at the company's Port Hope, Ontario, facility.
- A new cooling drum at Bibby-Ste-Croix will save the company $250,000 per year.
- Gamma Foundries has converted its facilities to high-efficiency lighting and is capturing waste process heat for space heating.
- Wabi Iron & Steel expects its new energy efficiency efforts to save between 5 percent and 10 percent on its annual energy costs.
- Environmental and cost concerns continue to drive fuel switching and the introduction of more energy-efficient equipment and methods within the sector.

ACTIONS Canada's foundries continue to focus on a multifaceted, industry energy efficiency improvement strategy. This strategy begins with goal setting and includes operational improvements, monitoring and targeting energy cost centres, investments in energy-efficient processes and technology, and employee training and awareness programs. Also included are the establishment of energy monitoring and control systems and the reclaiming of process heat for use in other operations. A number of foundries have reported notable energy efficiency actions.

For example, ESCO Limited - Port Hope Operations has established an energy conservation team at its Port Hope, Ontario, foundry to examine consumption patterns and explore available energy savings opportunities. The team's efforts have led to a significant modification of energy patterns to take advantage of cheaper "off peak" electricity rates and cut the foundry's electrical costs in half, saving the company more than $60,000 per month. ESCO has installed an E2MS electrical monitoring system and is seeking ways to expand monitoring to its natural gas, propane, air and water usage. The company is also refitting its compressed-air system to eliminate leaks and cut down on the air needed to carry out plant functions.

Wabi Iron & Steel Corporation has established an energy efficiency action plan, which includes a formal target-setting and review process. The company has adopted a strategy combining operational improvements, monitoring and targeting, capital investment and employee awareness. In 2000, Wabi Iron & Steel established an energy-management team at its New Liskeard, Ontario, plant, and launched an energy-usage monitoring program. The company expects to save between 5 percent and 10 percent on its annual energy costs by implementing measures that offer a payback in one year or less.

Gamma Foundries Limited has taken an aggressive approach to energy efficiency at its Richmond Hill, Ontario, facilities. The company has installed high-efficiency sodium lighting throughout its facilities, added motion-activated lighting in its lunchrooms, upgraded water heaters and installed power correction capacitor banks. Gamma Foundries has also installed its furnace cooling heat exchangers indoors, capturing waste heat and using it to heat the plant.

Bibby-Ste-Croix Foundries in Sainte-Croix, Quebec, has installed a cooling drum to maintain mould sand at a constant, cooler temperature. Cooler sand leads to better moulds and fewer rejected castings and is expected to enable the company to save in excess of $250,000 per year. The project will pay for itself in savings within 18 months.

The Ford Motor Company of Canada Limited's Windsor Casting Plant has undertaken a number of energy-reduction activities as part of a five-year action plan. In 2000, the plant upgraded its heat treat gas oven and Venetta dryer controls, leading to a

reduction in natural gas consumption of 2.7 million m^3. The plant also completed a program to identify and repair leaks throughout its compressed-air and hydraulic delivery systems.

At the sector level, the Canadian Foundry Association, supported by NRCan's Office of Energy Efficiency (OEE), has launched a two-year work plan to improve the sector's energy efficiency. Included in the first phase of the plan are the accumulation of appropriate baseline information on foundry energy use, the creation of a best practices sector energy guide and the development of a customized, one-day energy efficiency workshop based on the OEE's highly successful "Dollars to $ense" workshops. Foundry benchmarking data will be available in early 2001, and the sector's *Energy Efficiency Guidebook* is scheduled for publication later in the year. The first workshop was held in 2000, with three others scheduled for 2001.

The sector is currently working with CIEEDAC and the OEE to develop indices and figures.

ACHIEVEMENTS Environmental and bottom-line concerns, driven in recent months by the rapidly rising costs of energy, continue to motivate Canada's foundries to implement energy efficiency improvements and reduce greenhouse gas (GHG) emissions. A number of foundries have signed on as Industrial Energy Innovators. Many companies no longer use GHG-generating fuels such as coal, oil or coke in their operations and have eliminated the use of steam produced by coal-generated electricity.

Escalating oil, natural gas and power costs are leading a growing number of companies to adopt more energy-efficient equipment and methods and to turn to fuel switching and waste-energy capture programs. Active energy efficiency programs throughout the industry have led the sector to expect record improvements in its energy efficiency performance in the months ahead.

One advance that promises to help foundries cut wasted energy is a recently released furnace power-management software system that provides real-time demand management features. By automatically controlling furnace loads at optimal levels, the system can significantly reduce the energy used in the casting process.

CHALLENGES Over the past decade, demands on foundries to provide diversified, value-added services to their customers have grown substantially. Today, many foundries no longer simply provide raw castings. They are expected to design parts, build tooling, cast prototypes and make, machine and assemble the casting. Often, they are called on to produce a completed component or assembly ready for the customer's assembly line. While these additional activities have added to the sector's capabilities, employment and profit, they have also led to increased energy consumption.

Canada's foundries are on an endless search for energy-efficient equipment and methods. To remain competitive today, foundries must closely monitor energy consumption and implement programs to improve energy efficiency. The often conflicting needs to respond to customer demand for expanded services, remain price competitive and meet environmental standards are taxing the resources of many foundries and creating a need for new, cost-effective energy efficiency technologies and solutions.

PROFILE: The general manufacturing sector comprises a variety of industries, including leather, clothing, furniture, printing, machinery, construction materials, floor coverings, imaging products, insulation, adhesives and pharmaceuticals. The sector encompasses approximately 2000 small, medium-sized and large companies that, combined, consumed about 178 578 TJ of energy, or about 6.57 percent of the total energy consumed by all CIPEC sectors in 1999.

GENERAL MANUFACTURING

PERFORMANCE HIGHLIGHTS

- The approximately 2000 companies included in the general manufacturing category consumed about 178 578 TJ of energy in 1999.
- Task forces in Alberta and Quebec have broadened CIPEC's reach in western and eastern regions.
- Metroland Printing, Publishing and Distributing has completed a retrofit of its heating, cooling and ventilation equipment that will reduce its energy consumption by 1.5 million kWh.
- Crown Cork & Seal was a winner in Canada's Energy Efficiency Awards at Canada's Energy Efficiency Conference 2000 for the installation of a heat exchanger at its Calgary, Alberta, plant.
- New technology at Fibrex Insulations Inc. has earned the insulation producer local and provincial recognition for business excellence.
- Energy efficiency upgrades at Simmons Canada Inc. helped the company achieve a 12.45-percent reduction in natural gas usage and a 7.28-percent decrease in electrical consumption.
- By the end of 1999, S.C. Johnson and Son reduced its energy intensity by 9.7 percent, with further gains from a lighting retrofit and compressed-air upgrade achieved in 2000.

ACTIONS Regional task forces formed in Alberta and Quebec in 1998 are broadening industry representation in eastern and western Canada while providing forums to address their specific issues. In Quebec, the new regional task force has attracted an active membership that includes associations reaching nearly all corners of the province. The group has become both a focal point and a lightning rod for energy efficiency efforts in Quebec.

The Alberta regional task force is working with associations, companies and governments to address issues arising from deregulation and soaring power costs. Currently based in Edmonton, the group plans to broaden its participation within Alberta and expand its reach into the other western provinces.

Overall, the sector's energy efficiency awareness efforts are being bolstered with the help of other organizations. The Canadian Chamber of Commerce is actively promoting CIPEC by providing information to its members. Natural gas providers Union Gas Limited and Enbridge Consumers Gas offer a range of incentive programs and services designed to help industry conserve energy.

Individual general manufacturing sector members are also making important contributions to energy efficiency. For example, pharmaceutical manufacturer Wyeth-Ayerst Canada Inc. has made significant strides toward meeting a worldwide corporate mandate to reduce energy consumption over three years by 20 percent. Energy efficiency investments at its Saint-Laurent, Quebec, plant have so far reduced annual energy costs by $279,000, with further savings of $184,000 anticipated by 2001.

Owens Corning Canada (Toronto plant), which recently joined the Industrial Energy Innovators Initiative, hired the consulting firm ENRON Canada Corp. to conduct an energy audit of its facilities. As a result, the company was able to reduce air-conditioning power requirements by 26 percent. Owens Corning is also working on improving its compressed-air control systems and on developing a "zero process waste" system.

In addition to its own energy efficiency efforts, Owens Corning is providing a service to other companies seeking to reduce energy use. Owens Corning's Thermal Analysis Service uses digital and infrared thermal imaging technology to locate energy leakage and identify ways to optimize insulation performance. The service enables facilities to save energy and reduce operating costs.

Metroland Printing, Publishing and Distributing Ltd., of Toronto, Ontario, has completed a retrofit of its heating, cooling and ventilation equipment, which will reduce its energy consumption by 1.5 million kWh, or 174.4 kWh/m^2. The three-phase program, which was launched in 1997, replaced and refurbished fans, upgraded filtration and air balance, modernized chiller equipment, replaced the cooling tower and made other improvements at a total cost of $1.4 million.

S.C. Johnson and Son, Limited (Johnson Wax) has formed an internal CIPEC steering committee to review energy use in its Brantford, Ontario, facilities. ISO

14001 certified, the company actively pursues energy savings as part of its aggressive environmental program. By the end of 1999, the company had reduced its energy intensity by 9.7 percent, with further gains from a lighting retrofit and compressed-air upgrade achieved in 2000.

Crown Cork & Seal Canada Inc. is piloting the use of infrared drying technology at one of its Toronto-area plants. The technology appears to reduce the natural gas consumed to dry the coating on aluminum beverage cans by 15–20 percent, saving a projected 85 000 m^3 per annum in natural gas.

Simmons Canada Inc. has launched energy initiatives at its Brampton, Ontario, and Winnipeg, Manitoba, plants. Upgrades to its Brampton tempering ovens and Winnipeg lighting and heating systems helped the company achieve a 12.45-percent reduction in natural gas usage and a 7.28-percent decrease in electrical consumption.

ACHIEVEMENTS The General Manufacturing Sector Task Force continues to pursue activities outlined in its 1999–2000 action plan. Specific elements of the plan include the following:

- achieve an energy efficiency improvement target of 1 percent per annum to the year 2010;
- establish regional task force divisions for western and eastern Canada;
- distribute letters of support for CIPEC and the Industrial Energy Innovators Initiative;
- maintain ongoing collaborative efforts with organizations, including the Canadian Association of Man-Made Vitreous Fibre Manufacturers (CAMMVFM), the Canadian Chamber of Commerce, the Canadian Manufacturers and Exporters Association, Gaz Métropolitain, Duke Solutions, Enbridge Consumers Gas and Union Gas;
- increase the involvement of other associations and firms;
- encourage energy efficiency progress reporting by the sector's Industrial Energy Innovators; and
- share industry ideas and information on energy efficiency opportunities and strategies.

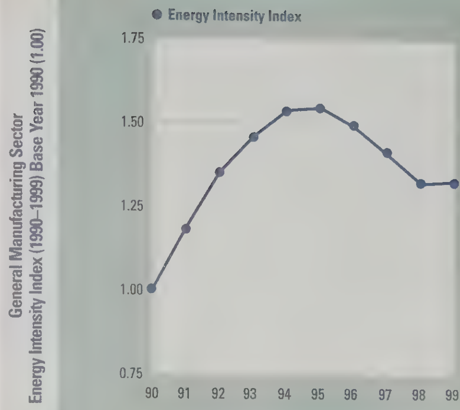
Sector companies continue to earn recognition for their efforts toward improved energy efficiency. Following are two examples.

Crown Cork & Seal was a winner in Canada's Energy Efficiency Awards at Canada's Energy Efficiency Conference 2000 for the installation of a heat exchanger at its Calgary, Alberta, plant. The new device is enabling the company to use waste heat from its air compressors as process heat for its can-washing line.

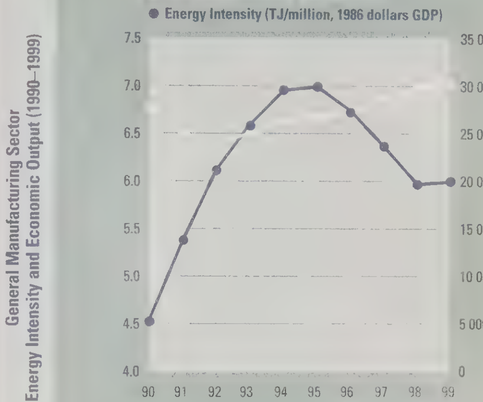
Industrial Energy Innovator Fibrex Insulations, Inc. has introduced new machinery to produce high-quality rock wool insulation and hydroponic growing material. The machinery took three years to develop and uses the most advanced automation and control technology available. The project has earned Fibrex a Business Excellence Award from the Sarnia-Lambton Chamber of Commerce and a nomination for the Ontario Outstanding Business Achievement Awards sponsored by the Ontario Chamber of Commerce.

CHALLENGES Manufacturers in the general manufacturing sector must balance the total costs of improving energy efficiency against the need to compete for domestic and international market share with overseas companies not bound by the same constraints. For less energy-intensive companies, the relatively small role energy plays in overall costs makes it difficult to justify major capital expenditures. Where energy is a larger component of overall costs, many manufacturers, especially smaller ones, lack the knowledge and financial resources to identify and act on energy-saving opportunities. Larger companies often find that lack of staff and capital resources to dedicate to energy projects is a significant impediment.

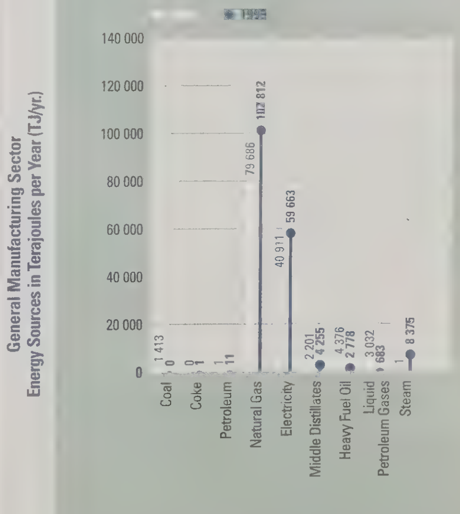
The sector's unusual diversity presents a challenge, making it difficult for its task forces to represent the interests of all of the general manufacturing sector. Compounding difficulties for the sector is the lack of meaningful baseline energy data. Because of changes to the sector's composition, data concerning the General Manufacturing Sector Task Force used in the CIPEC annual reports before 1995/1996 are no longer applicable and cannot be compared with data in later reports.



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–1999.* October 27, 2000, Simon Fraser University.



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–1999.* October 27, 2000, Simon Fraser University.



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–1999.* October 27, 2000, Simon Fraser University.

PROFILE: **Canada's merchant lime sector supplies essential raw materials for steel production, mining, pulp and paper manufacturing, water treatment, environmental management and other basic industries. Operating 16 facilities, the sector's four companies directly employed more than 700 people and had a combined lime calcining capacity of 3.1 million tonnes in 1999. From 1998 to 1999, lime production rose by 1.3 percent, with a total increase of 26.5 percent from 1990 to 1999.**

LIME

PERFORMANCE HIGHLIGHTS

- From 1990 to 1999, the lime sector increased production by 26.5 percent.
- Graymont (NB) Inc. cut the fuel used in its kilns by 440 000 litres per year.
- Graymont (QC) Inc. is making a strong march toward energy efficiency at its three Quebec plants.
- Beachville Lime's recently upgraded capacitors raise its power factor from 86 percent to 96 percent.
- While the sector's total energy consumption increased by 2231 TJ between 1990 and 1999, the energy intensity index decreased by 9.1 percent.
- Companies representing 98.7 percent of the lime production capacity in Canada's merchant lime sector are now Industrial Energy Innovators.

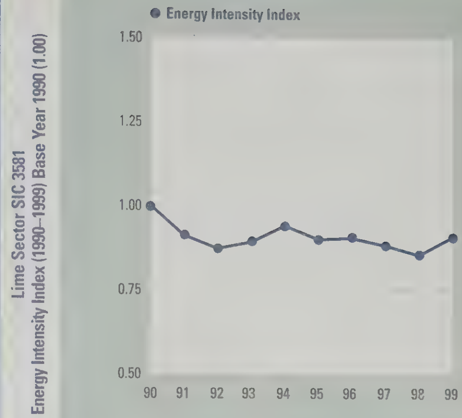
ACTIONS Individual companies in the lime sector continue to make significant energy efficiency improvements. For example, Graymont (NB) Inc. has installed variable frequency drives on fans and blowers to reduce power consumption, introduced an environmental management system emulating the ISO 14000 International Environmental Standard and taken steps to improve the efficiency of its kilns. These actions have enabled Graymont (NB) Inc. to cut its total energy consumption in the kiln process from 105.8 litres of oil per tonne of product to 99.6 litres, leading to an annual reduction in fuel consumption of 440 000 litres.

Graymont (QC) Inc. is making a strong march toward energy efficiency throughout its three Quebec plants. At its Bedford facility, the company installed large, energy-efficient motors and a new preheater rotary lime kiln. At Joliette, a high-efficiency draft fan in the number two kiln cut horsepower requirements by half, thereby reducing power consumption. At Marbleton, the company has established a state-of-the-art plant with energy-saving kiln technology, including the use of computerized controls for superior process stability, quality control and energy efficiency.

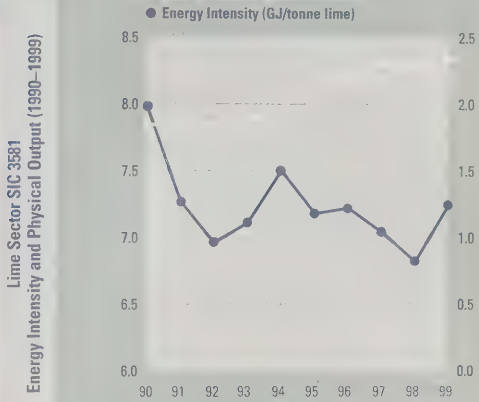
Capacitor upgrades at Beachville Lime Limited have improved the power factor at the company's Ingersoll, Ontario, facility from 86 percent to 96 percent, thereby ensuring transformer efficiency and eliminating future power factor penalties.

In 2000, Beachville Lime, Dundas Lime Limited and Northern Lime Limited became Industrial Energy Innovators. With the addition of these three companies, Industrial Energy Innovators account for 98.7 percent of production capacity in the Canadian merchant lime sector.

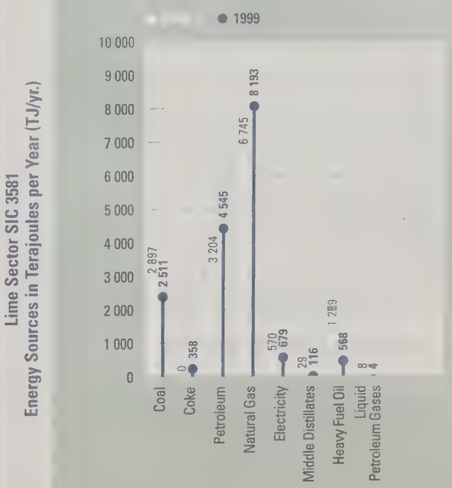
ACHIEVEMENTS Companies represented by the Canadian Lime Institute continue to work actively to improve the energy efficiency of their operations. While total energy consumption increased by 2231 TJ between 1990 and 1999 (as production increased by 26.5 percent), the energy intensity index decreased by 9.1 percent. In 1999, the energy intensity index increased 5.5 percent from 1998 levels. The sector's target is a continuing improvement at a rate of 0.3 to 0.5 percent per year through to 2001. Since the 1970s, the merchant lime sector has decreased its energy intensity by an estimated 18.5 percent.



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–1999.* October 27, 2000, Simon Fraser University.



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–1999.* October 27, 2000, Simon Fraser University.



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–1999.* October 27, 2000, Simon Fraser University.

Greenhouse gas (GHG) emissions resulting from the production of lime are offset to some extent by the reabsorption of CO_2 by lime during its life cycle. The National Lime Association estimates that more than 25 percent of the lime produced in Canada and the U.S. reabsorbs CO_2 either in process or naturally.

CHALLENGES The production of lime occurs at high temperatures using large quantities of combustion fuel. Natural gas is the principal fuel source, with petroleum, coke and coal making up most of the balance. In an industry heavily dependent on such fuels, rapidly rising fuel prices make energy efficiency a top priority. However, while ongoing refinements continue to be made to existing calcining equipment, substantial capital investments in new, more efficient kiln installations are needed in order to make major gains. Lime producers continue to be challenged to find the capital necessary for such investments.

Producers are also challenged to balance energy efficiency with quality. Fuel switching and high-efficiency large kiln technology may reduce energy requirements, but they can also interfere with product quality, a significant concern for some of the sector's largest customers.

PROFILE: ***Canada's well-established mining industry directly employs 386 000 people, with an annual payroll of $4.2 billion in its mining, smelting and refining activities. In 1999, the sector's output was valued at $27.7 billion, or 3.7 percent of the nation's GDP. The Canadian mining sector exports roughly 80 percent of its production, valued at $44 billion, or 13.3 percent of total domestic exports. Canada's mineral and metal exports increased by 52 percent between 1993 and 1999.***

MINING

PERFORMANCE HIGHLIGHTS

- Since 1989, anode production at Noranda's Horne Smelter rose 40 percent while energy consumption declined 8.1 percent, GHG emissions decreased 25.1 percent and energy intensity fell 34.4 percent.
- At Noranda's Gaspé Smelter, energy intensity improved by 32.5 percent and GHG intensity dropped by an impressive 37.5 percent over the past decade.
- Falconbridge's Sudbury Division completed a mine-ventilation automation project that is expected to reduce power consumption by 25 GWh per year.
- INCO has established a formal Energy Breakthrough system to establish a system-wide approach to energy conservation and GHG emissions reductions.
- MAC has developed *Strategic Planning and Action on Climate Change – A Guide for Canadian Mining Companies,* a handbook to help companies plan, implement and report climate change actions.

ACTIONS Energy efficiency is a priority for members of the Mining Association of Canada (MAC), in their efforts to reduce production costs and contribute to Canada's overall global competitiveness.

For example, Noranda Inc. adapted its Horne Smelter in Rouyn-Noranda, Quebec, to handle electronic scrap and other secondary materials containing gold, copper, silver and other metals. At the facility, a metallurgical acid plant with advanced gas-cleaning equipment processes off-gas from the reactor and continuous converter, while Pierce-Smith converters are being adapted for desulphurization. From 1989 to 1999, anode production rose 40 percent, while energy consumption declined 8.1 percent, greenhouse gas (GHG) emissions decreased 25.1 percent and energy intensity fell 34.4 percent.

Similar results were achieved at Noranda's Gaspé, Quebec, smelter. While production rose by a substantial 63.4 percent between 1989 and 1999, energy consumption increased by only 10.2 percent. Energy intensity improved by 32.5 percent, and GHG intensity dropped by an impressive 37.5 percent. Company-wide, GHG emissions compared with the 1989 base year are 36.6 percent below "business as usual" levels.

In Ontario, the Sudbury Division of Falconbridge Limited completed a mine-ventilation automation project. This undertaking uses sophisticated underground technologies to control main and auxiliary ventilation fans and to monitor air quality and vehicle location. The potential total reduction in energy consumption is 25 GWh per year, which represents an annualized savings of $1.4 million. In addition, the division achieved natural gas consumption reductions totalling 3.2 GWh, leading to a 0.6-kilotonne decrease in direct GHG emissions.

INCO Limited has established the foundation for a new concept in energy management. Called the Energy Breakthrough (EB) system, the initiative embodies a system-wide approach to energy conservation and GHG emissions reductions and has set aggressive energy-reduction targets. INCO is backing up its efforts with a strong internal and external communications program designed to raise awareness of environmental issues. The EB system builds on a successful energy-reduction track record that has seen the company's overall energy consumption decrease by 15.2 percent, from 21 035 TJ in 1990 to 17 837 TJ in 1999.

In addition to individual actions, MAC members are working together to advance energy efficiency. For example, 10 Canadian mining operations participated in an energy benchmarking study of underground bulk mining, which presented an overall framework for GHG emissions analysis as well as individualized reports for each company. Open-pit mining energy benchmarking activities involving MAC and Natural Resources Canada (NRCan) are pending. In addition, MAC, in conjunction with Industry Canada and NRCan, completed an energy cost-curve analysis.

MAC has developed a handbook called *Strategic Planning and Action on Climate Change – A Guide for Canadian Mining Companies,* a publication designed to present companies with a process for planning, implementing and reporting climate change actions. The association's energy managers' Internet chat line, designed to facilitate the sharing of information and best practices and to provide assistance in solving energy problems, continues to attract the participation of Canadian mining companies.

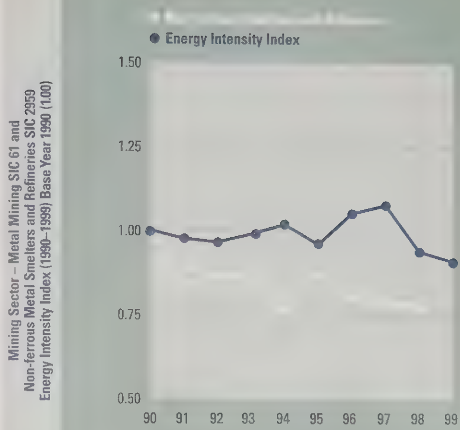
MAC is actively engaged in Canada's Climate Change Voluntary Challenge and Registry Inc. (VCR Inc.), the National Advisory Council on Energy Efficiency's board and several Climate Change Issue Tables. As of December 2000, 16 of MAC's 33 members, representing most of the energy consumption related to metal mining and non-ferrous smelting and refining, had submitted action plans to VCR Inc., and MAC continues to work vigorously to increase participation. Also in 1999, MAC contracted two recognized environmental consultants, the Pembina Institute for Appropriate Development and Resource Futures International, to provide guidance on developing corporate strategies and action plans to help members meet the challenges of reducing GHG emissions while also building international competitiveness.

ACHIEVEMENTS The metal mining industry's energy mix is heavily weighted toward electricity (48.05 percent), followed by heavy fuel oil (15.70 percent) and middle distillates (14.56 percent). In 1999, total energy use in the metal mining sector was 71 423 TJ, or 2.63 percent of total Canadian industrial energy consumption. Compared with 1990, metal mining energy use was 29.6 percent lower in 1999.

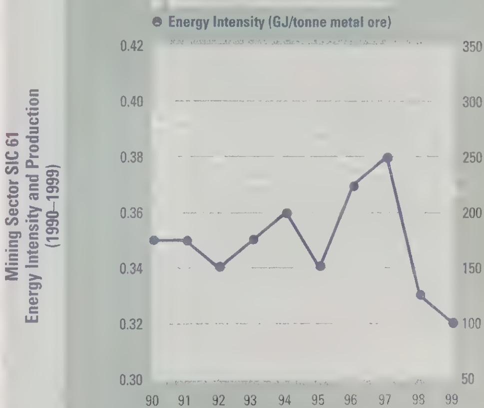
The non-ferrous metal smelting and refining industry (excluding aluminum and magnesium) has an energy mix weighted toward electricity (48.6 percent), followed by natural gas (25.6 percent) and coal (12.6 percent). In 1999, total energy use was 84 068 TJ. Compared with 1990, the industry's energy use was 3.5 percent higher in 1999 due to higher levels of production. Total GHG emissions (direct, indirect and other) were 7.5 percent lower in 1999 than they were in 1990.

CHALLENGES A combination of increasing energy costs, fluctuating international metal prices, stiff competition and rapid technological change continues to put pressure on the mining sector's resources. Despite these challenges, the Canadian mining industry remains an economic and technological leader, investing billions of dollars in capital projects, and ranks among the top 10 Canadian industrial sectors in productivity growth.

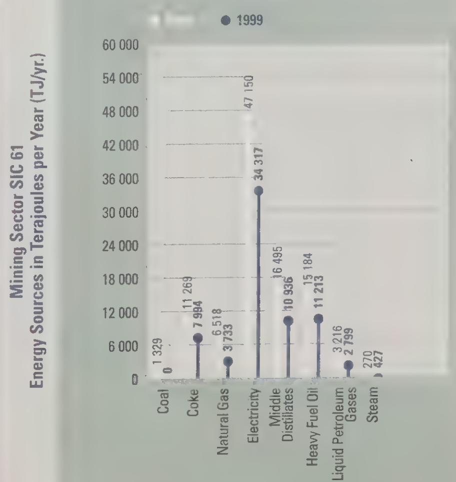
Despite improvements in energy use per unit of output and in recording emissions throughout the 1990s, the mining sector will be challenged as the industry expands and energy requirements grow. Energy represents between 10 and 25 percent of production costs, making energy efficiency an important part of the industry's overall competitiveness strategy. Thus, it is imperative for MAC to continue to bolster the industry's energy efficiency efforts. Members believe that, despite global economic challenges, the mining sector will continue to make substantial energy efficiency gains.



Data source for SIC 2959: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Canadian Minerals Yearbook, 1998, A Review of Energy Consumption and Related Data: Canadian Mining and Metal Refining Industries 1990 to 1997.*



Data source for SIC 61: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–1999.* January 2001, Simon Fraser University.



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–1999.* January 2001, Simon Fraser University.

*PROFILE: **Canada's oil sands sector includes two plants in northern Alberta and one heavy oil upgrader in Saskatchewan. Together, these facilities produce more than 300 000 barrels per day of crude oil for markets in Canada and the U.S. The sector is a major employer and a significant contributor to Canada's GDP.***

OIL SANDS

PERFORMANCE HIGHLIGHTS

- The oil sands sector is committed to ongoing improvements in its energy efficiency and intensity, through a combination of operational excellence and technological innovation.
- Husky Oil began drawing power from a cogeneration project at its Lloydminster, Saskatchewan, site, reducing GHG emissions by 168 000 tonnes of CO_2 per year.
- Suncor's oil sands emissions per unit of production in 1999 bettered the company's targets and improved on 1998 results by 10 percent.
- From 1988 to the end of 1999, Syncrude cut CO_2 emissions per barrel of oil produced by 26 percent.
- The upcoming Athabasca Oil Sands Project is committed to a best practices approach to environmental management.
- In 1999, energy consumed per unit of production fell to 7.98 GJ/m^3, a 4.32-percent improvement over 1998 and a total improvement of 28.3 percent since 1990.

ACTIONS The oil sands sector is committed to ongoing improvements in its energy efficiency, through a combination of operational excellence and technological innovation. Plants are improving the reliability of their operations and introducing programs to recover waste heat and boost yields through more efficient processing. Other gains have come from the introduction of new technologies in the mining and extraction stages.

In late 1999, Husky Oil began drawing power from the Meridian Cogeneration Project at its Lloydminster, Saskatchewan, heavy oil upgrader site. The project is a joint effort with TransAlta Energy Corporation, the cogeneration plant's operator. Steam transferred from the plant has enabled Husky to reduce the heat in some of its boilers, leading to an estimated emissions reduction equivalent of 168 000 tonnes of CO_2 per year. A further 14 000-tonne reduction in CO_2 equivalent was achieved when Husky optimized process controls on its upgrader power boilers.

Suncor Energy Inc., Oil Sands has employed strategies such as debottlenecking and eliminating pressure drops in its steam system, improving extraction energy efficiency, increasing the use of coker gas and reducing flaring to achieve reductions in its greenhouse gas (GHG) emissions. Emissions per unit of production in 1999 beat the company's targets and bettered 1998 results by 10 percent. At 0.738 tonnes of CO_2 equivalent per unit of production, 1999 results were 30 percent below the benchmark 1990 level. Suncor forecasts that a combination of new technologies, processing improvements and other efficiency initiatives will lead to a further drop in GHG emissions to 0.572 tonnes of CO_2 equivalent by 2005.

Syncrude Canada Ltd. is in the midst of an 11-year strategic capital investment program called "Syncrude 21." Begun in 1997, the program aims to upgrade oil sands operations, thereby improving energy efficiency and GHG emissions. The first stage of this four-stage program, which covers the company's new North Mine and several debottleneck projects in its upgrader, has been completed, and the new facilities are in operation. The second stage, which includes the first train of the company's Aurora Project and further debottlenecking of bitumen processing units, was put into operation in the second quarter of 2000. "Syncrude 21" and predecessor activities have had a significant impact on the company's energy efficiency and, subsequently, on GHG emissions. From 1988 to the end of 1999, Syncrude cut CO_2 emissions per barrel of oil produced by 26 percent. The company estimates that by 2008 the total reduction will improve to 42 percent.

The Athabasca Oil Sands Project, announced late in 1999, is committed to a best practices approach to environmental management. The project plans to build on the experience of existing oil sands operators and implement new technologies to increase

environmental performance in all of its new facilities. Energy efficiency is a priority for the project, and the Athabasca consortium plans to use gas-fired cogeneration at both of its facilities. The project expects to begin operations late in 2002.

ACHIEVEMENTS

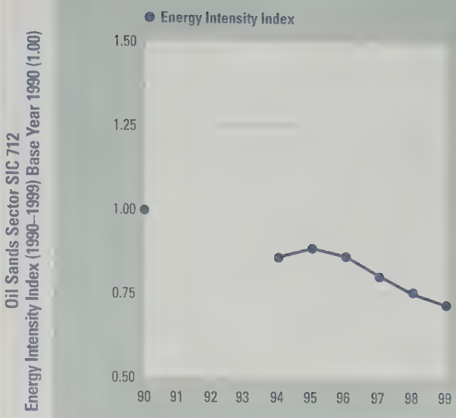
In 1999, the oil sands sector continued its march toward energy efficiency. Energy consumed per unit of production fell to 7.98 GJ/m^3, a 4.32-percent improvement over 1998. This compares favourably with the sector's target of a 1-percent minimum average improvement in energy efficiency per unit of production. While total annual production rose 46.29 percent since 1990, energy use rose only 25.66 percent. In 1999, energy consumption totalled 177 599 TJ. Energy intensity showed a total improvement of 28.3 percent since 1990.

Oil sands industry members continue to emphasize energy efficiency and are constantly pursuing ways to minimize the impact of their operations on the environment. Their commitment is reflected in their efforts to reduce the use of coke by switching to natural gas, resulting in a significant reduction in GHG emissions.

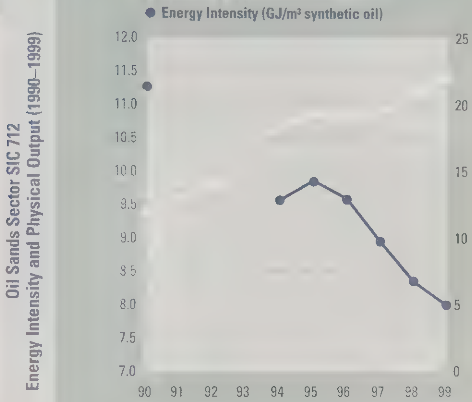
CHALLENGES

The sector's principal challenges are technological and financial. Oil sands operators must continue to combine investment in innovative technologies with operational excellence to reduce the energy consumed in production. Better, less energy-intensive extraction methods must be implemented, and material-handling systems must be modified to more efficiently accommodate increasing production loads.

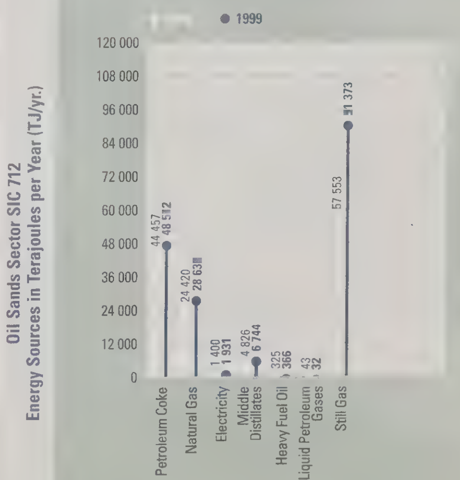
This process is both time-consuming and expensive. The long lead times and substantial investments required to introduce enhancements continue to force difficult choices on the industry and affect the sector's progress toward greater energy efficiency.



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–1999.* October 27, 2000, Simon Fraser University.



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–1999.* October 27, 2000, Simon Fraser University.



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–1999.* October 27, 2000, Simon Fraser University.

PROFILE: Canada's petroleum products sector markets gasoline, diesel, heating oil, jet fuels, lubricating oil, grease, food-grade white oils, asphalts and aromatic hydrocarbons through a network of more than 15 000 wholesale and retail outlets nationwide. Operating 21 oil refineries across the country, the industry provides direct employment for 100 000 Canadians and generates an additional 100 000 indirect jobs (Employment in the Canadian Petroleum Industry, Canadian Energy Research Institute, Special Report 2000–1, September 2000).

PETROLEUM PRODUCTS

PERFORMANCE HIGHLIGHTS

- The industry operates 21 oil refineries across the country and provides 100 000 direct jobs.
- Parkland Refining has improved its energy efficiency index by 25 percent since 1990.
- Ultramar has made a number of capital investments to improve energy efficiency at its Saint-Romuald, Quebec, refinery.
- Irving Oil Limited has included more than $100 million worth of environmental controls in its $1-billion Saint John refinery upgrade project.
- Petro-Canada has introduced improvements in 1999 that cut more than 36 000 tonnes of GHG emissions and saved over 700 000 GJ of energy.
- Imperial Oil Limited initiated or evaluated projects that could reduce CO_2 emissions by 21 400 tonnes per year.
- Shell Canada plans to spend $50 million for energy efficiency capital improvements at its three refineries between 2000 and 2005.
- Sunoco has targeted an annual improvement of 2 percent per year over the 2002–2008 period.
- In 1999, the sector's energy intensity index stood at 92.1, a 1.39-percent improvement since 1998 and 18.3 percent better than in 1990.

ACTIONS Member refineries of the Canadian Petroleum Products Institute renewed their commitment to energy efficiency by extending the goal to improve refining the sector's energy intensity index by 1 percent per year through to 2005.

The Canadian Association of Petroleum Producers, in co-operation with the Canadian Energy Research Institute, held a two-day best practices conference entitled "Voluntary Actions by the International Oil and Gas Industry to Address Climate Change" in April 2000. The conference covered topics such as best practices for emissions measurement and reduction, ways to reduce the energy and carbon intensity of oil and gas, fuels of the future and developing partnerships with the auto industry.

Individual Canadian refiners continue to invest in capital projects and operate programs that enhance energy efficiency.

Parkland Refining Ltd.'s Bowden, Alberta, refinery has upgraded electrical equipment to improve power efficiency, installed an efficient new crude heater and increased refinery throughput to reduce its energy intensity. These and other measures have enabled the facility to improve its energy efficiency index by 25 percent since 1990.

Ultramar Ltd.-Saint-Romuald Refinery has made a number of capital investments to improve energy efficiency at its Saint-Romuald, Quebec, refinery. The company introduced process modifications to reduce wasted steam in its air cooler, including an automatic louvre system, saving the company 240 tonnes of steam per day for six months of the year. Additional steam is being saved through the ongoing installation of pipeline insulation. In 1999, the company began using water from the fluidized catalytic cracker (FCC), instead of boiler feed water, to wash the FCC air coolers, saving 70 tonnes per day in steam.

Irving Oil Limited has included more than $100-million worth of environmental controls in its $1-billion Saint John, New Brunswick, refinery upgrade project. Combined, these environmental controls will reduce the plant's CO_2 emissions by 670 000 tonnes per year. The refinery was awarded an Honourable Mention citation at Canada's Climate Change Voluntary Challenge and Registry Inc. (VCR Inc.) 1999 Leadership Awards Ceremony.

Petro-Canada has introduced improvements at a number of refineries. These measures have significantly improved energy intensity and reduced greenhouse gas (GHG) emissions. Between 1994 and 1999, the company's downstream operations achieved an overall 7-percent improvement in energy intensity. Actions taken in 1999 alone cut more than 36 000 tonnes of GHG emissions and saved over 700 000 GJ of energy. The company earmarked $4 million specifically for energy efficiency projects in 2000.

Imperial Oil Limited initiated or evaluated a number of replacements, upgrades and process-control enhancements at its facilities in 1999 and 2000, which could reduce CO_2 emissions by 21 400 tonnes per year. Along with its parent and sister companies,

Imperial Oil will soon roll out its Global Energy Management System, a key tool in the company's efforts to improve energy efficiency in its manufacturing operations.

Shell Canada Limited now makes on-line energy efficiency calculation available to operators on many of its processing units to provide real-time feedback, tracking, target setting, accountability and optimal energy utilization. The results directly impact the company's bonus and profit-sharing programs. Shell plans to spend $50 million for energy efficiency capital improvements at its three refineries between 2000 and 2005. Expansion and modifications at the company's Scotford, Alberta, refinery are expected to reduce CO_2 emissions by a combined 300 000 tonnes per year.

Suncor Energy Inc.-Sunoco Group's refinery is undergoing a business plan review to achieve further improvements in energy management and GHG emissions. A proposed cogeneration plant at the Sarnia, Ontario, facility is expected to cut GHG emissions by 174 600 tonnes of CO_2 equivalent annually. Since 1990, the company has reduced emissions by 6.4 percent despite a production increase of 3.2 percent over the same period. In 1999, Sunoco set an aggressive new energy efficiency goal for the refinery – an annual improvement of 2 percent per year over the 2002–2008 period.

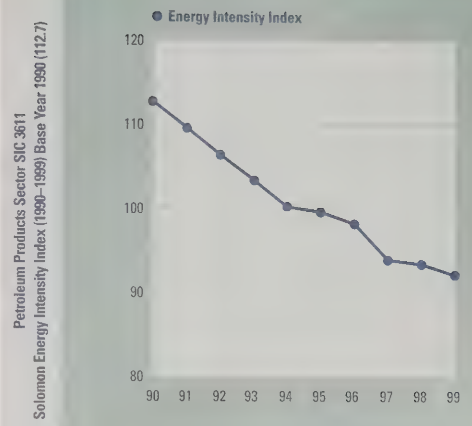
Chevron Canada Limited-Burnaby Refinery continued its focus on energy efficiency into 2000, including the installation of new burners and attention to steam-trap maintenance and insulation.

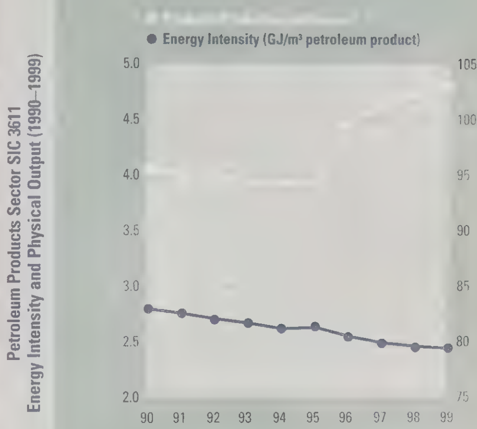
Mobil Oil Canada was awarded Gold Level Champion Reporter status by VCR Inc. for its action plans to reduce GHG emissions.

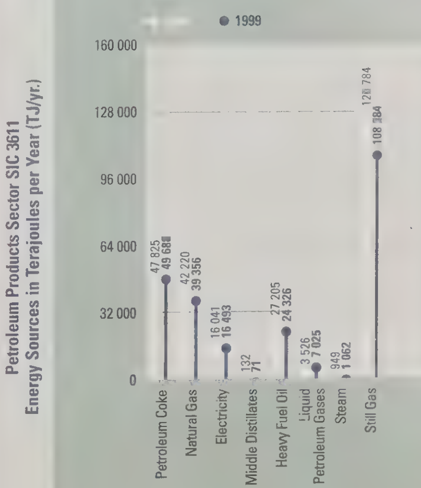
ACHIEVEMENTS Production of petroleum products continued to grow in 1999, while the industry's energy intensity decreased. During the year, production rose by 0.8 percent over 1998, while energy intensity fell by 0.98 percent to 2.43 GJ/m³. Compared with the 1990 base year, the sector's total energy consumption has decreased by 6 percent to 250 134 TJ. Between 1998 and 1999, energy consumption decreased by 391 TJ, or 0.15 percent. In 1999, the sector's energy intensity index stood at 92.1, a 1.39-percent improvement since 1998 and 18.3 percent better than 1990, exceeding the industry's commitment of a 1-percent-per-year improvement.

CHALLENGES Pressures for increased production in the face of economic uncertainty and escalating crude costs will make ongoing energy efficiency improvements more challenging. Since higher-capacity utilization improves refinery efficiency, thereby lowering the energy required per unit of output, refiners will be challenged to maintain production at optimum levels in a period of unpredictable demand. In 1999, capacity utilization was 90.2 percent, compared with 89.5 percent in 1998.

The industry also faces increasing pressure to reduce the benzene and sulphur levels in gasoline and diesel fuels. Meeting increasingly stringent content standards requires refineries to employ more energy-intensive methods, processes which make it more difficult and expensive to reduce CO_2 emissions. New energy efficiency concepts will be needed for the industry to maintain its trend of continuous improvement.







A Review of Energy Consumption in Canadian Oil Refineries and Upgraders: 1990, 1994 to 1999. Prepared for the Canadian Petroleum Products Institute (CPPI) and the Canadian Industry Program for Energy Conservation (CIPEC) by John Nyboer and Bryn Sadownik. Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). October 2000, Simon Fraser University.

PROFILE: Pulp and paper, a key component of the forest products industry, is a major contributor to Canada's economy. Besides pulp, the sector includes the newsprint, paperboard, building board and other paper subsectors. In its 125 plants across Canada, the pulp and paper industry produced 31.4 million tonnes of product in 1999.

PULP AND PAPER

PERFORMANCE HIGHLIGHTS

- The pulp and paper sector's total production rose to 31 410 kilotonnes in 1999.
- Fuel switching, better use of existing equipment, adoption of energy-efficient equipment and processes and the increased use of cogeneration have enabled the industry to move toward its energy efficiency goals.
- Smurfit-Stone Container Canada Inc. put energy efficiency front and centre for a month, as part of its year-long "défis Attitude 2000" awareness program.
- Weyerhaeuser completed a $315-million Waste Wood Low Odour project at its Prince Albert, Saskatchewan, facility in mid-2000.
- Spruce Falls Inc. is the first pulp and paper company in Ontario to achieve ISO 14001 certification.
- Energy-reduction projects at Tembec Industries' Skookumchuck pulp mill have enabled the company to run the mill with a single kraft recovery boiler.
- The Pulp and Paper Technical Association of Canada has published *A Guide to Energy Savings Opportunities in the Kraft Pulp Industry.*
- The pulp and paper industry has improved its energy consumption per tonne of output by 11.2 percent since 1990.

ACTIONS Pulp and paper companies continue to improve energy intensity and implement programs to switch from fossil fuels to biomass. Following are some examples.

Smurfit-Stone Container Canada Inc. put energy efficiency front and centre for a month as part of its year-long "défis Attitude 2000" awareness program. With Natural Resources Canada's (NRCan's) Office of Energy Efficiency (OEE) participating in a special two-day employee awareness event at the company's La Tuque, Quebec, facilities, Smurfit-Stone Container attracted considerable local media attention. CFLM radio broadcast a segment on the OEE–Smurfit-Stone partnership, and local and regional publications picked up the industry energy efficiency story. Response from employees, management and the local community was highly positive.

Weyerhaeuser Canada Ltd. completed a $315-million Waste Wood Low Odour (WWLO) project at its Prince Albert, Saskatchewan, facility in mid-2000. As part of the project, Weyerhaeuser installed a new recovery boiler, converted an existing boiler to burn wood waste and shut down a second recovery boiler and two package boilers. The whole system is run with state-of-the-art control systems and stack monitoring and uses a new wood-waste processing and delivery system. The new systems reduce recovery boiler emissions from as high as 240 ppm (parts per million) to less than 5 ppm and cut particulate emissions to less than 70 mg/m^3. The WWLO project slashes natural gas usage by up to 70 percent and cuts purchased power requirements in half.

Spruce Falls Inc., a Tembec Industries company, is the first pulp and paper company in Ontario to achieve ISO 14001 certification. The certification is a two-and-a-half-year effort that reaffirms Tembec's commitment to continued environmental improvements and responsible management of all natural resources.

Three energy-reduction projects at Tembec Industries' Skookumchuck pulp mill in Cranbrook, British Columbia, have combined to enable the company to shut down its natural gas-fired boiler and run the mill with a single kraft recovery boiler. The projects have reduced the steam needed to heat boiler feedwater by 15 000 lb. per hour and cut the mill's freshwater intake by up to 1000 U.S. gallons per minute. In addition, the mill has substantially reduced its natural gas use and realized savings of $15 per air dry metric tonne.

With the support of NRCan, the Pulp and Paper Technical Association of Canada has published *A Guide to Energy Savings Opportunities in the Kraft Pulp Industry.* The guide gives pulp and paper engineers a practical, step-by-step approach to improving the energy efficiency of kraft mills by using energy audits, benchmarking and the evaluation and implementation of energy-saving ideas.

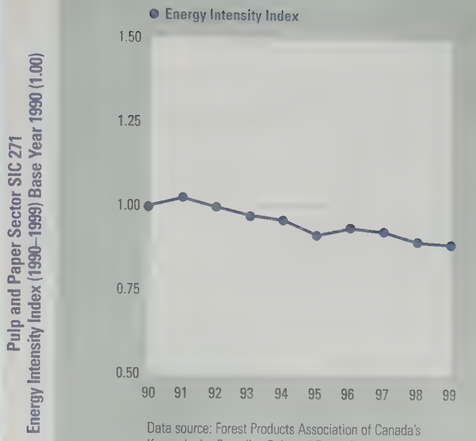
In addition, *Energy Cost Reduction in the Pulp and Paper Industry* has been published by the Pulp and Paper Research Institute of Canada (Paprican). A three-day seminar based on the monograph has been created for sector companies.

The Pulp and Paper Sector Task Force was strengthened in 2000 when the Quebec Forest Industries Association signed a letter of co-operation with CIPEC.

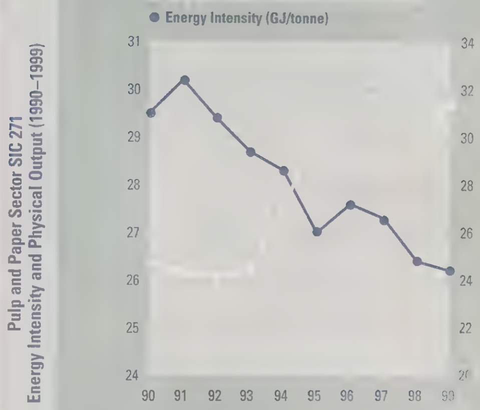
ACHIEVEMENTS The pulp and paper industry has improved its energy consumption per tonne of output by 11.2 percent since 1990. This achievement is consistent with the industry's commitment of a 1-percent improvement in energy efficiency per year from 1990 to 2000. The sector decreased its total energy consumption per tonne of pulp or paper from 29.5 GJ in 1990 to 26.2 GJ in 1999. Over the same period, the consumption of fossil fuel and electricity (excluding biomass) decreased from 14.2 GJ to 11.8 GJ. The portion of total energy supplied by biomass increased from 50.5 percent in 1990 to 54.0 percent in 1999.

Thanks to an ongoing switch to biomass fuel sources, the pulp and paper industry is reducing its use of less environment-friendly fossil fuel sources, despite growing production. The use of biomass, including wood waste, sludge and pulping liquor, has risen by 23 percent, from 378 200 TJ in 1990 to 464 868 TJ in 1999. Over the same period, the use of heavy fuel oil has been reduced by 39.8 percent. As a result, when biomass energy is excluded, it took 16.9 percent less energy to produce a tonne of pulp and paper in 1999 than it did in 1990. When biomass energy is included, the improvement is 11.2 percent.

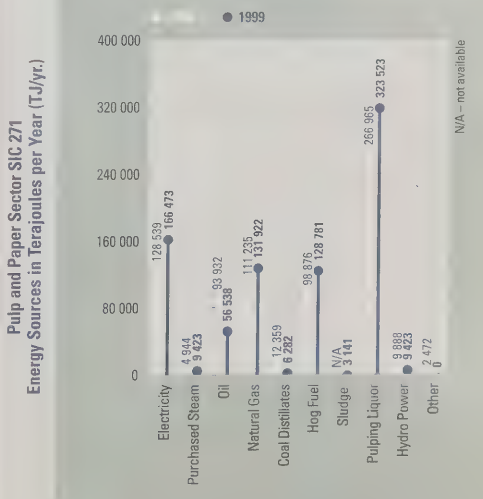
CHALLENGES Fuel switching, especially from fossil fuels to biomass fuels, promises to help the sector achieve additional reductions in energy intensity. However, the availability of wood residues (such as bark, sawdust and wood shavings) is limited in many areas, making transportation costs a significant barrier to greater use of residue surpluses in some parts of Canada. Moreover, production curtailments have led to restrictions on capital spending, creating a serious challenge for companies seeking to further improve energy efficiency and reduce greenhouse gas emissions.



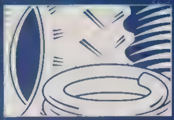
Data source: Forest Products Association of Canada's (formerly the Canadian Pulp and Paper Association) *Energy Monitoring Report*. December 12, 2000.



Data source: Forest Products Association of Canada's (formerly the Canadian Pulp and Paper Association) *Energy Monitoring Report*. December 12, 2000.



Data source: Forest Products Association of Canada's (formerly the Canadian Pulp and Paper Association) *Energy Monitoring Report*, December 12, 2000.



PROFILE The rubber products industries sector comprises establishments that are primarily engaged in manufacturing tires and tubes, automotive parts, rubber hoses and belting, mechanical rubber goods and a wide variety of other products, such as rubber and plastic weather stripping, pressure-sensitive tape, rubber gloves, rubber mats, rubber household products and tire-retreading materials. To meet demand for its products, the rubber products industry employs just over 26 000 people in some 240 facilities nationwide, providing a total payroll of more than $700 million annually.

RUBBER

PERFORMANCE HIGHLIGHTS

- The rubber products industry employs just over 26 000 people in some 240 facilities nationwide.
- Industry production rose from 531 961 tonnes in 1990 to 1 203 324 tonnes in 1999.
- The sector published *Energy Efficiency Opportunities in the Rubber Industry* to help manufacturers cut their energy costs.
- The sector developed an industry environmental tracking model to enable plants to benchmark their progress against the industry's.
- Despite the increase in energy consumption demanded by increased production and improved air-emissions quality standards, the sector continues to reduce its energy intensity.

ACTIONS As the rubber industry's national trade association, the Rubber Association of Canada (RAC) plays a crucial role in co-ordinating and focusing the industry's environmental efforts. The rubber sector is made up of large multinational companies operating efficient, modern plants and smaller, locally owned firms that, while generally efficient, do not always have the same benefit of scale available to large multinationals. The ability of smaller, or local, firms to implement energy efficiency measures varies by company. As a result, many of the energy efficiency activities being undertaken in the industry are aimed at these firms, including the following:

- publishing an energy efficiency guidebook aimed at assisting rubber manufacturers to identify opportunities for energy savings within their facilities. Entitled *Energy Efficiency Opportunities in the Rubber Industry*, the guide provides information on quantifying energy costs, energy-consuming equipment, energy-saving tips, energy monitoring and control systems and conversion factors;
- offering energy efficiency workshops to rubber manufacturers;
- conducting workshops to assist manufacturers to gain environmental site approvals; and
- developing an industry environmental tracking model to enable individual plant managers to benchmark their progress against that of the industry.

The RAC sponsors and mounts a biennial, international rubber-recycling forum to foster the development of the commercial rubber-recycling industry – an emerging but fragile new industry. The event, "Rubber Recycling 2000: A World of Opportunity," was held October 11–13, 2000, in Toronto, Ontario. It must be noted, however, that successful rubber recycling is heavily dependent on backdrop legislation in each jurisdiction that supports waste collection and delivery to processors. Hence, local governments must accept responsibility for creating an environment conducive to rubber recycling.

By maintaining the industry's focus on environmental issues, the RAC plays a constructive role in improving energy intensity and reducing greenhouse gas (GHG) emissions.

ACHIEVEMENTS The North American rubber industry has largely rationalized. As a consequence, industry activity tends to be concentrated in larger firms (i.e., 100 or more employees), which account for over 70 percent of total shipments. Coupled with the rationalization has been an ongoing global shake-out and consolidation. For example, in 1999, Dunlop Tire was absorbed by The Goodyear Tire & Rubber Company, and The Standard Products Company became part of Cooper Tire & Rubber Company. In 2000, Thona became part of SaarGummi GmbH of Germany. This activity has led to the closing of older plants and the consolidation of product manufacture within the most efficient operations worldwide.

Because the industry is currently operating at close to full capacity, meeting increased demand may require capital investment, providing an opportunity to introduce additional, new, energy-efficient technologies and processes. However, given the globally rationalized nature of the rubber industry, there is no guarantee that such investment will be made in Canada.

Based on data collected by the Rubber Association of Canada for 1999, total production of the rubber products sector was some 1 203 324 tonnes, with a value of approximately $5 billion, up from 531 961 tonnes and $2.6 billion in 1990. The majority of the total value of shipments were exports, with over 95 percent of these going to the United States.

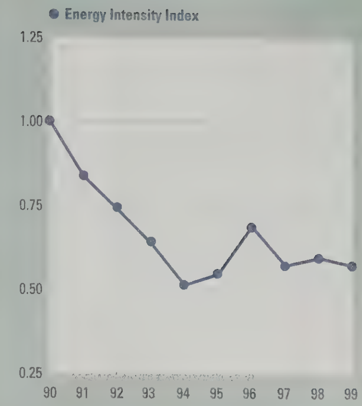
The cost of fuel and electricity for the rubber products sector is approximately 2 percent of shipments. In comparison, total wages were 25 percent of shipments, while the cost of materials and supplies used during production was 54 percent of shipments. Approximately 50 percent of the industry's energy requirements are filled by natural gas, 35 percent by electricity and nearly all of the rest by heavy fuel oil.

In absolute terms, energy consumption for the rubber products industry increased between 1990 and 1999, rising from 9115 TJ in 1990 to 11 794 TJ in 1999. However, the sector's gross output increased at a higher rate, leading to a decline in energy intensity over the same period. The industry kept its energy use to a 24-percent increase over the same period, mainly by increased capital investment in plants and machinery, as well as through an industry-wide trend to continuous seven-day operations. Both of these have had a positive impact on energy efficiency.

CHALLENGES The rubber industry has become increasingly energy efficient since 1990, a trend aided by pressures to reduce production costs and by the impact of consolidation and industry rationalization. Canadian-based subsidiaries of larger multinational firms in the rubber industry operate within a global context, and generally have modern, energy-efficient facilities, with high production capacities. While new capital investment could provide opportunities to lower the energy intensity for the sector, such investment may not be made in Canada. Canadian policy-makers must remain cognizant that, within a globally rationalized industry, investment decisions are generally made after a rigid corporate capital pool analysis of all competing international production jurisdictions. Personal and business taxation play a significant role in the decision-making process.

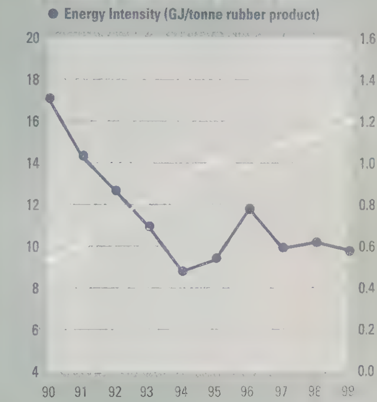
Deepening the challenge are signs that difficult times are ahead for sectors, such as rubber, that are heavily dependent on the North American automotive industry. At a time when shareholder expectations have never been more demanding, Canadian rubber manufacturers are being hit with increasing economic uncertainty, higher costs, lower prices and reduced volumes. Exacerbating the problem, recent and proposed government legislation will add significant cost to rubber tire production. For example, in the United States – the destination for 85 percent of the Canadian industry's production – the National Highway Traffic Safety Administration has promulgated the *Transportation Recall Enhancement, Accountability and Documentation (TREAD) Act*. This Act significantly alters the way tires are marked and has added enormous expense to mould costs. Canadian regulations are harmonized with those in the United States, and there will be similar and parallel action on the part of Transport Canada. At a time when the industry faces the pressures of shareholder expectations, market uncertainty, increased energy and raw-material costs and declining margins, it will also face significant additional regulatory overhead.

Rubber Sector SIC 15
Energy Intensity Index (1990–1999) Base Year 1990 (1.00)



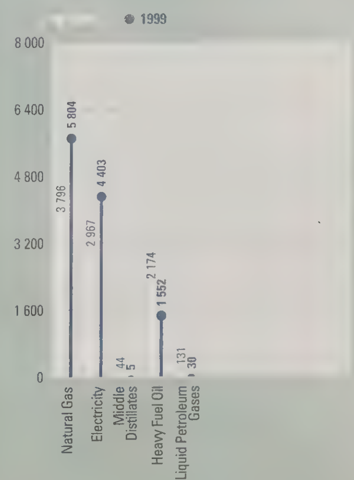
Data source: 1990 and 1996 to 1999, Rubber Association of Canada (RAC), 2001. Years 1991 to 1995, RAC, 2000.

Rubber Sector SIC 15
Energy Intensity and Physical Output (1990–1999)



Data source: 1990 and 1996 to 1999, Rubber Association of Canada (RAC), 2001; 1991 to 1995, RAC, 2000.

Rubber Sector SIC 15
Energy Sources in Terajoules per Year (TJ/yr.)



Data source: 1990 and 1996 to 1999, Rubber Association of Canada (RAC), 2001; 1991 to 1995, RAC, 2000.

PROFILE: ***Canada's steel sector is one of the country's largest industries, generating sales of more than $11 billion, including $3.6 billion in exports in 1999. The industry includes 17 plants that directly employ 34 500 workers. The companies that make up the steel sector supply flat-rolled (sheet and plate), long (re-bar and structural steel) and specialty and alloy (stainless and tool steels) products for major markets, including transportation, oil and gas, appliances, packaging and construction. Facilities are found in six provinces, with Ontario accounting for 70 percent of Canadian steel production.***

STEEL

PERFORMANCE HIGHLIGHTS

- The steel industry includes 17 plants that melt and pour steel, directly employing 34 500 workers.
- The industry registered strong performance in shipments, sales and exports in 1999.
- Since 1990, the industry has achieved an 18.2-percent improvement in energy consumed per tonne shipped.
- The sector's average annual energy efficiency improvement is 2 percent, surpassing the industry's commitment of 1 percent per year.
- Lake Erie Steel was a winner in Canada's Energy Efficiency Awards 2000 for its "Air Separation Plant Powered With By-Product Fuel" project.
- The industry now uses about 30 percent less energy per tonne than it did in the early 1980s and is producing superior products at significantly lower prices.

ACTIONS Canadian steelmakers continued to emphasize energy efficiency as a major thrust of productivity, quality and cost-reduction efforts in 1999 and 2000.

Atlas Specialty Steels (Division of Atlas Steel Inc.) of Welland, Ontario, introduced a number of measures to improve energy efficiency. The company outfitted table drives with variable frequency control, installed a new Car Bottom reheat furnace and upgraded car furnaces. Atlas also replaced ladle heaters to improve temperature control, upgraded plant lighting and installed an automated Bar Cell in its finishing department.

Dofasco Inc. of Hamilton, Ontario, initiated measures to reduce steam consumption in its coke-making plants. The company metered operations in two of its coke plants and refreshed a steam-trap program to monitor, identify and replace faulty traps throughout the business unit. Steam efficiency was improved by modifying the exhausters that are used to remove gas from coke ovens. Dofasco has also set an internal energy efficiency improvement goal for business-planning purposes.

Stelco-McMaster Ltée of Contrecoeur, Quebec, modernized its bar mill by replacing the rolling mill and installing high-efficiency electric motors. The new bar mill will enable the company to improve off-gas post-combustion in the plant's EBT furnace.

Gerdau Courtice Steel Inc. of Cambridge, Ontario, has added oxy-fuel burners to its electric arc furnaces to reduce power consumption and improve furnace efficiency.

QIT - Fer et Titane Inc. of Tracy, Quebec, installed new burner controls to improve combustion efficiency and increase control in ladle preheating.

Sydney Steel Corporation of Sydney, Nova Scotia, introduced a plant-wide program to reduce non-process power consumption, achieving a 20-percent reduction in electrical use.

AltaSteel Ltd. of Edmonton, Alberta, has installed energy-efficient motors and converted office lighting to high-efficiency fluorescent ballasts and tubes. In 2001, the company will begin phase one of a bar mill upgrade that will significantly improve productivity and reduce yield losses.

Stelco's Hilton Works in Hamilton, Ontario, uses waste heat and by-product fuels to produce a large percentage of its process steam. Reheat furnace skid-pipe heat loss is minimized with added insulation, while new controls precisely measure and control fuel and combustion airflow. The company is in the process of replacing natural gas furnace cooling with nitrogen top cooling, and installing new control instrumentation on the hot strip mill and plate mill furnaces.

Lake Erie Steel Company Ltd. of Nanticoke, Ontario, completed an upgrade of its boiler controls and construction of a high-efficiency reheat furnace.

ACHIEVEMENTS The Canadian steel industry registered strong performance in shipments, sales and exports once again in 1999. During the year, the industry produced 16.1 million tonnes of steel and shipped 15.0 million tonnes. However, due to weakening economic conditions for the industry, this trend did not continue through 2000.

Since 1990, the industry has achieved an 18.2-percent improvement in energy consumed per tonne shipped. The average annual energy efficiency improvement was 2.0 percent, surpassing the industry's commitment of 1.0 percent per year to 2000 from the adjusted 1990 rate of 21.18 GJ per tonne shipped. In addition, the trend toward less carbon-intensive energy use in the industry has meant that 1999's overall CO_2 emissions were 9.0 percent below adjusted 1990 levels.

Within the industry, over 90 percent of companies representing more than 90 percent of production have made voluntary, corporate energy efficiency improvement commitments through a number of initiatives. These include the Industrial Energy Innovators Initiative, Canada's Climate Change Voluntary Challenge and Registry Inc. (VCR Inc.) and ÉcoGESte. The Steel Sector Task Force is confident that, between 2000 and 2010, the Canadian steel industry will improve energy intensity by an average 1 percent per year compared with the 2000 base year. Achieving this target will enable the sector to record an equivalent improvement in energy consumption per tonne shipped of 1.6 percent per year over the 20-year period from 1990.

Lake Erie Steel Co. of Nanticoke, Ontario, was a winner in Canada's Energy Efficiency Awards 2000 for its "Air Separation Plant Powered With By-Product Fuel" project. Lake Erie Steel is using waste steam generated from blast furnace gas to power compressors in the smelter's cryogenic air separation plant. As a result of this creative approach, the company has reduced its electricity costs by about $1.7 million annually and achieved significant, enduring environmental benefits.

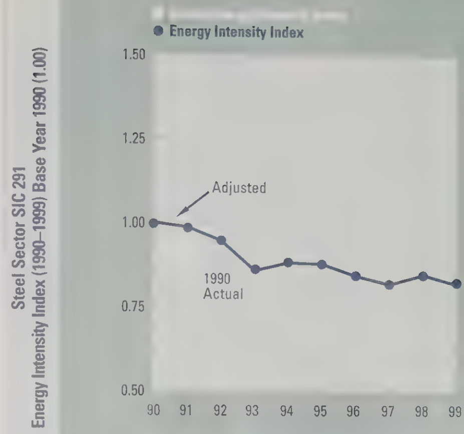
CHALLENGES Steelmakers must improve productivity in step with, or ahead of, their competitors to hold on to their customers, attract investment capital and sustain well-paid jobs. In the face of increasing global competition, they must reduce costs while still delivering higher-value products to their customers.

The steel industry has responded to these challenges with innovation, new technology and substantial capital investments. As a result, the industry now uses less energy per tonne than it did in the early 1980s, producing superior products at significantly lower prices. Despite these successes, maintaining and improving productivity remains a deepening challenge for the industry.

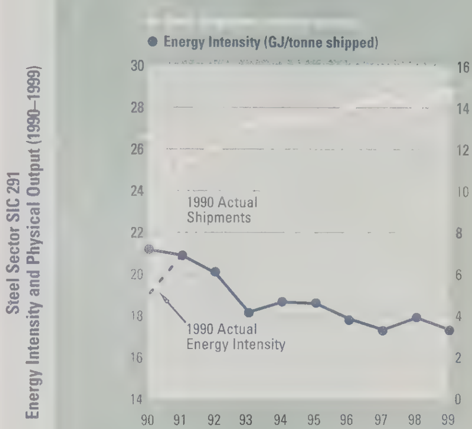
Pressures on productivity, efficiency and competitiveness have been exacerbated by trends in international trade. Canadian producers must not only compete for the North American market share with U.S. mills, but also meet the added pressures of steel imports from abroad. With worldwide steel production running ahead of international markets, offshore producers have turned to a strong North American market for sales, often at prices below the cost of production. This severely strains the ability of North American producers to compete, forces production cutbacks and limits the capital available for energy efficiency activities.

The impact of import competition has been exacerbated by rapidly rising energy prices. Over the past two years, natural gas prices have escalated dramatically. With natural gas supplying 34 percent of the industry's energy, the benefits of the industry's dramatic gains in energy efficiency have been offset by higher energy costs, further reducing the funds available for investment.

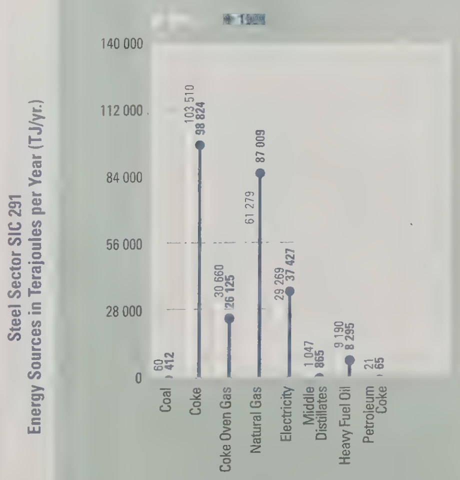
The Canadian steel industry continues to support liberalized trade and open markets on a level international playing field. However, with many international suppliers based in low-wage countries not covered by the Kyoto Protocol and with emerging countries maintaining government-supported excess capacity, it is a challenge to ensure effective tools are in place to prevent unfairly traded imports. Establishing a level playing field will take a higher degree of co-operation and commitment from governments around the world than is currently being demonstrated. Until then, strong action is needed by both the industry and government to ensure that all producers selling into Canadian markets are competing on an even footing.



Data source: Statistics Canada, *Quarterly Report on Energy Supply and Demand*, February 2001.



Data source: Statistics Canada, *Quarterly Report on Energy Supply and Demand*, February 2001.



Data source: Statistics Canada, *Quarterly Report on Energy Supply and Demand*, February 2001.

PROFILE: Canada's textiles sector produces the fibres, yarns and fabrics used in industries as diverse as automotive manufacturing, clothing, construction, environmental protection and road building. The textiles sector is organized into three subgroups – primary textiles, textile products and motor vehicle fabric accessories. Together, the industry sells to 150 markets around the world, exporting 33 percent of its production.

TEXTILES

PERFORMANCE HIGHLIGHTS

- Canada's textile industry sells to 150 markets and exports over 33 percent of its production.
- In 1999, the industry GDP output was 26 percent higher than in 1990, while its energy consumption increased by only 11 percent.
- The sector's energy mix continues to shift from hydrocarbon sources to electricity.
- Investment in new technology by Manoir Inc. has reduced its water consumption in dyeing and finishing to one of the lowest rates in the North American textile industry.
- St. Lawrence Corporation has reduced its 1999 energy usage per kilogram of product to 74 percent of 1990 levels.

ACTIONS A number of companies have added their names to the textiles sector's list of Industrial Energy Innovators in 2000, including the following: Bennett Fleet Inc., Vanier, Quebec; Manoir Inc., Saint-Laurent, Quebec; and Monterey Textiles 1996 Inc., Drummondville, Quebec.

Throughout the sector, companies are benefiting from more efficient uses of energy. Manoir Inc., Saint-Laurent, Quebec, operates a dyeing and finishing plant that processes 3 million kilograms of fabric each year. The company has implemented a sustained water-conservation program that has reduced its water consumption to 64.6 litres per kilogram of dyed product, saving 140 000 m^3 of water per year. Manoir's water consumption for dyeing and finishing operations is now among the lowest in the North American textile industry. In May 2000, Manoir's achievement earned a Biosphère prize from Environment Canada and the Montréal Urban Community.

By the end of 1999, St. Lawrence Corporation, Iroquois, Ontario, had reduced energy usage per kilogram of product to 74 percent of 1990 levels. Installation of a new Wash Range resulted in an 18-percent reduction in water consumption. New weaving machines resulted in an energy saving of 38 percent per kilogram of product. St. Lawrence Corporation has also published three pamphlets as part of its employee awareness program. The pamphlets emphasize the company's commitment to greenhouse gas (GHG) reduction, describe the company's action plan and explain climate change and its importance for Canadians.

DuPont Canada Inc. replaced older equipment with a new High Temperature Heat Transfer Fluid Vaporizer. The unit has a heat efficiency 20 percent greater than the equipment it replaced, resulting in a savings of 20.4 TJ per year, with a corresponding reduction in natural gas use and GHG emissions. By the end of 1999, total energy use per unit of production at DuPont Canada Inc. was 28 percent lower than it was in 1990. This compares well to the company's goal of a 25-percent reduction between 1990 and 2000 and a further 15-percent reduction by 2005. While total production in 1999 was 9.4 percent ahead of 1998, absolute energy usage was up by only 2.2 percent, and energy usage per unit of production was down by 6.8 percent.

In 2000, DuPont Canada Inc. signed a Master Energy Services Agreement with AGRA-Cogenex to carry out energy performance contracts in all of DuPont Canada's facilities. Energy-conservation projects worth about $16 million are being studied in the first phase of this project.

In 2000, the Textiles Sector Task Force confirmed the comprehensive action plan introduced in 1997 and agreed to concentrate on two principal goals: to broaden the participation of textile manufacturers in the Industrial Energy Innovators Initiative and Canada's Climate Change Voluntary Challenge and Registry Inc. (VCR Inc.) and to strengthen the commitment of existing Industrial Energy Innovators. Manufacturers participating in the task force have agreed to demonstrate, by example, the economic benefits that flow from effective energy efficiency programs. Moreover, task force members remain committed to following up directly and personally with the sector's Industrial Energy Innovators to review their progress in fulfilling their commitment.

The industry is continuing its own survey to identify and correct inconsistencies and errors in the textiles sector data currently available in government reports. More accurate information will enable the industry to establish better measures of success in meeting energy efficiency targets. In addition to the industry's own data-gathering activities, the Canadian Textiles Institute is providing a fourth year of financial support to the Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC) at Simon Fraser University.

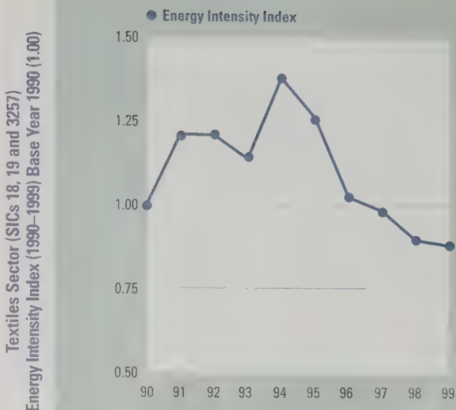
ACHIEVEMENTS The textiles sector's energy usage continues to shift from hydrocarbon sources to electricity. Natural gas use has declined from 64 percent of total energy consumption in 1990 to 48 percent in 1999. Consumption of other hydrocarbon fuels declined from 8 percent in 1990 to 5 percent in 1999. Electricity's share rose from 28 percent in 1990 to 38 percent in 1999.

As a result of the industry's efforts to improve the accuracy of reporting by individual companies, Statistics Canada's 1999 data more accurately reflect the industry's experience. While the industry's GDP output in 1999 was 26 percent higher than in 1990, its total energy consumption increased by only 11 percent.

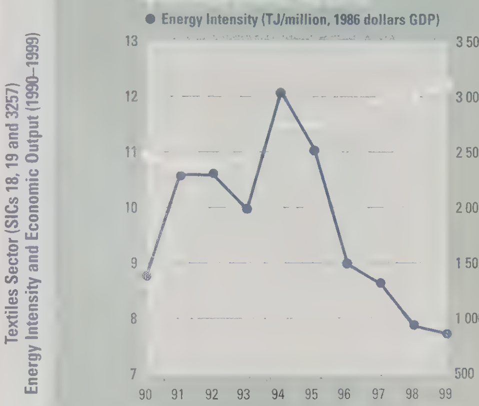
In August 1999, the Textiles Sector Task Force committed the industry to a new energy intensity target of 1 percent per year for the period 2000–2010. Efforts in the coming years will build on the sector's improved energy efficiency performance since 1995 and reflect ongoing consultations to meet Canada's Kyoto commitments.

CHALLENGES The task force believes that a key challenge is to gain the active involvement of more of the industry's major producers as Industrial Energy Innovators. Toward that end, task force members continue to lead in efforts to broaden participation.

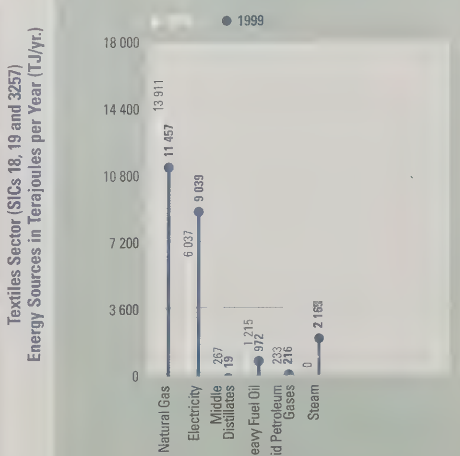
Along with developing methods to measure energy use more accurately, increased efforts are required to sensitize those in the textile industry to the long-term implications of Canada's Kyoto commitments and to encourage active participation in the new national implementation strategy for energy efficiency. During 2000, the Textiles Sector Task Force and the Canadian Textiles Institute have devoted time and resources to these challenges. To achieve success, these efforts must be intensified.



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–1999.* October 27, 2000, Simon Fraser University.



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–1999* October 27, 2000, Simon Fraser University.



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–1999.* October 27, 2000, Simon Fraser University.

PROFILE: The Canadian transportation equipment manufacturing sector includes the manufacturing of aircraft, aircraft parts, automobiles, motor vehicle parts, trucks, buses, trailers and military vehicles, as well as railroad rolling stock, ships and pleasure boats. The sector is a major part of the Canadian economy, accounting for nearly 3 percent of Canada's GDP and over 15 percent of the total manufacturing GDP in 1999. Including dealer, parts and distribution networks, the sector employs more than half a million people across Canada.

TRANSPORTATION EQUIPMENT MANUFACTURING

PERFORMANCE HIGHLIGHTS

- Transportation equipment manufacturing accounted for nearly 3 percent of Canada's GDP and over 15 percent of the total manufacturing GDP in 1999.
- Task force members assisted the Transportation Equipment Manufacturing Sector Working Group of the National Climate Change Industry Table to formulate the sector's "Foundation and Technology Assessment Reports."
- General Motors of Canada Limited implemented energy efficiency projects in 1999 that resulted in savings of more than $1.4 million.
- An oven upgrade at Ford of Canada's Windsor Casting Plant reduced annual natural gas usage by over 101 000 GJ, at a cost savings of over $1 million.
- DaimlerChrysler now uses direct condensor water for cooling in the electrocoat painting process at its Pillette Road Truck Assembly Plant, saving more than 750 000 kWh and reducing annual costs by $45,000.
- By the end of 1999, the sector achieved an overall improvement in energy intensity of 17.8 percent, compared with 1990 levels.

ACTIONS The CIPEC Transportation Manufacturing Sector Task Force includes representatives of automotive, automotive parts and aircraft manufacturers, as well as utilities and Natural Resources Canada's Office of Energy Efficiency. The task force is seeking to expand the sector's coverage to include rail and marine manufacturers.

The task force continued its tradition of promoting energy efficiency at its fourth annual "One-Day Energy Conference" held in September 1999 at Husky Injection Molding Systems Ltd. in Bolton, Ontario. The conference included the presentation of energy success stories within the automotive and parts industry, as well as updates on climate change and CIPEC/Canada's Climate Change Voluntary Challenge and Registry Inc. (VCR Inc.). The day finished with a tour of the Husky facility. The task force currently plans to hold its next annual energy conference in the first quarter of 2001 at General Motors in Oshawa, Ontario.

During 2000, the task force wrote to all Industry Energy Innovators in the transportation equipment manufacturing sector, encouraging them to submit progress reports to CIPEC and VCR Inc. on energy efficiency improvements. Task force members also assisted the Transportation Equipment Manufacturing Sector Working Group of the National Climate Change Industry Table to formulate the sector's "Foundation and Technology Assessment Reports."

The task force met on a monthly basis during the year to receive energy efficiency updates and to develop conferences and outreach programs to encourage others to join. Enbridge Consumers Gas joined the task force in 2000 and has been a welcome addition. Individual sector members have made significant advances in energy efficiency. Following are some examples.

- General Motors of Canada Limited implemented energy efficiency projects in 1999 that resulted in savings of more than $1.4 million. These projects included improvements to heating and ventilation, manufacturing processes and compressed-air systems, along with the installation of high-efficiency lighting and new energy-management practices. One project, a modification project for the dust collector controls at the Oshawa, Ontario, body plant, reduced annual electrical energy usage by 41 000 000 kWh.
- The Ford Motor Company of Canada, Limited's Windsor Casting Plant in Ontario upgraded its heat treat gas oven and dryer controls. The result is a reduction in natural gas usage of over 101 000 GJ and a cost savings of over $1 million.
- Process modifications enabled DaimlerChrysler Corporation to phase out the 130-tonne capacity electrocoat CFC chillers at its Pillette Road Truck Assembly Plant. Direct condenser water now fills the cooling needs of the electrocoat painting process, saving the company more than 750 000 kWh and reducing annual costs by $45,000.

• An engineering student, under the guidance of the Automotive Parts Manufacturers Association, led an Energy Resources Management System pilot program at Polycon Industries in Guelph, Ontario. The program helped to identify opportunities for energy savings and ways to minimize maintenance costs.

ACHIEVEMENTS Although a robust economy in 1999 added 18 percent to the value of the total output of the transportation equipment manufacturing sector, energy usage remained surprisingly close to that of 1998. In 1999, the sector consumed 68 342 TJ of energy, up 30 percent since 1990. Over the same period, gross output increased by 70 percent, leading to an overall improvement in energy intensity of 17.8 percent compared with 1990 levels. Overall energy use by the sector is 2.8 percent of the total for all industries in Canada. Within the sector, the largest energy users are motor vehicle assembly plants and automotive parts facilities, which account for 41 percent and 38 percent of energy consumption, respectively.

Energy use by fuel type has remained fairly constant since 1990, with natural gas (56 percent) and electricity (36 percent) making up the bulk of the energy used. Liquid petroleum gases, middle distillates (No. 2 fuel oil), heavy fuel oil and coal use have continued to decline since 1990. However, with the continuing price escalation of natural gas, this trend may soon reverse.

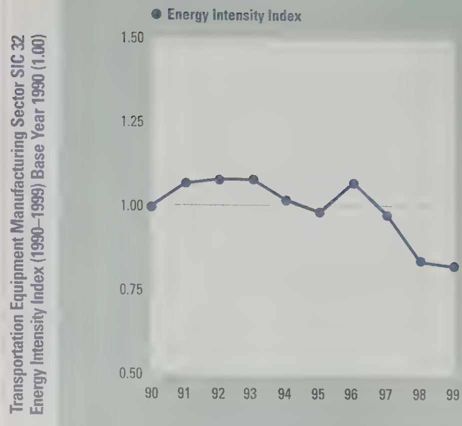
Over the long term, the sector expects to grow an average of 1.5 percent per year. While motor vehicle manufacturing will grow at a relatively modest pace, reflecting the mature state of the North American automotive market, the Canadian production of automotive parts should grow at a considerably faster pace. This reflects lower labour costs and other trends that increasingly favour Canadian sourcing of automotive parts.

CHALLENGES The transportation equipment manufacturing sector is committed to continuously improving quality, environmental performance and energy efficiency. Energy-efficient equipment is being installed wherever feasible, but investment payback requirements of less than two years and internal competition for funds are challenging energy managers who are seeking to make major gains. Moreover, energy efficiency improvements arising from the implementation of new technology are likely to be offset by trends that are driving energy use higher. These trends include the increased use of cooling to improve working conditions, more demanding pollution control and shifts to more energy-intensive products and processes.

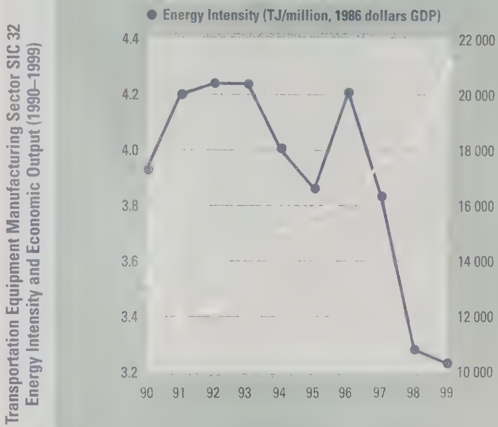
Unless there are major breakthroughs in technology, energy efficiency improvements in the transportation equipment manufacturing sector are likely to come in small increments. Moreover, since the sector is already an efficient energy user, there are relatively few cost-effective opportunities for dramatic gains. Cogeneration represents the single biggest opportunity for energy efficiency improvement, but not all industry facilities are well suited to its use, and current uncertain economic conditions limit the ability of manufacturers to commit to such investments.

These challenges notwithstanding, the sector continues to take strong action to reduce greenhouse gas emissions. The 1990 base year was a low production year for the sector. Since then, economic recovery combined with industrial growth has caused emissions to increase by 30 percent to the end of 1999, despite the sector's best efforts. It is improbable that the sector will meet a sector-specific target that parallels Canada's overall Kyoto commitment to reduce overall emissions by 6 percent from 1990 levels.

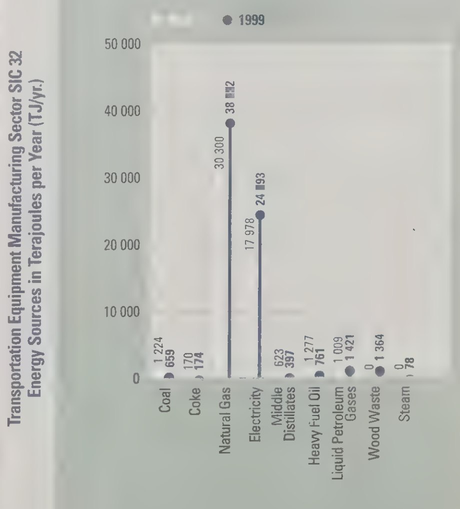
The transportation equipment manufacturing sector continues to support a goal of 1-percent-energy-per-unit reductions per year through the year 2005. The sector will support efforts to reach this goal by holding an energy conference in the first quarter of 2001 and by encouraging auto parts suppliers to join the Industrial Energy Innovators Initiative. Sector companies will continue to submit action plans to VCR Inc. In addition, the task force will seek additional representation, including rail and marine manufacturers, along with electrical utilities.



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–1999.* October 27, 2000, Simon Fraser University.



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–1999.* October 27, 2000, Simon Fraser University.



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–1999.* October 27, 2000, Simon Fraser University.

PROFILE: The wood products industry consists of nearly 3000 establishments across Canada employing just under 20 000 workers. The sector includes sawmills, planing mills and shingle mills that manufacture products ranging from timber to finished lumber for domestic and world markets.

WOOD PRODUCTS

PERFORMANCE HIGHLIGHTS

- Canfor Corporation, based in Vancouver, British Columbia, is turning wood waste into useful products.
- Nexfor Inc.'s cogeneration facility in Edmundston, New Brunswick, has reduced fuel costs by 75 percent.
- Abitibi-Consolidated invested $7.45 million to modernize its Senneterre, Quebec, sawmill.
- Domtar Inc. is completing a $130-million investment program at its Quebec and Ontario sawmills to increase efficiency and raw material utilization.
- Buchanan Lumber spends millions of dollars each year to research and implement new technologies.
- Fuel switching to biomass energy sources remains a major industry focus as companies seek to reduce production costs and improve their energy efficiency.

ACTIONS Forest product companies continue to make investments which improve their utilization of raw materials and energy efficiency. For example, Vancouver, British Columbia-based Canfor Corporation is diverting wood waste to make useful products. At its Chetwynd, British Columbia, mill, the company uses 66 000 BDt (bone-dry tonnes) of previously burned whitewood each year to produce pulp. At its Polar, British Columbia, sawmill, a $5.4-million investment now enables the company to truck approximately 28 000 BDt of whitewood per year to a sawdust digester, reducing Canfor's biomass fuel greenhouse gas (GHG) emissions by an estimated 146 kilotonnes per year. Canfor also installed a merchandiser to increase the amount of usable solid wood received from the wood residue generated at its Beaver Cove dryland sort on Vancouver Island. Canfor estimates that 20 percent of the approximately 6800 BDt per year of wood residue produced at the dryland sort is now recovered instead of incinerated. These efforts will enable Canfor to achieve a 9.6-percent reduction in GHG emissions by the end of 2000.

A cogeneration facility at Nexfor Inc.'s Edmundston, New Brunswick, plant has reduced fuel costs by 75 percent by replacing fossil fuels with wood waste. In 1998, the company reduced its GHG emissions by 23.1 percent from 1990 levels, through energy efficiency projects and by replacing fossil fuel with biomass. Despite doubling production between 1990 and 1998, the company's fossil fuel energy use has remained constant.

Abitibi-Consolidated Inc. invested $7.45 million to modernize its Senneterre, Quebec, sawmill. Completed in 1999, the upgrade makes the company's Senneterre mill more competitive by increasing productivity and recovery and reducing production costs. The project has increased the sawmill's annual production, while reducing its chip output, by approximately 15 percent, thanks to more efficient use of raw material.

Domtar Inc. is in the middle of a three-year, $130-million investment program at its Quebec and Ontario sawmills to increase efficiency and raw material utilization. The program will enable the company to produce more lumber and develop new value-added products, without increasing the harvesting of forest resources. Domtar has already succeeded in improving its fibre recovery rate by 11 percent in 1999 and hopes to do as much in 2000 and the coming years.

Buchanan Lumber of High Prairie, Alberta, spends millions of dollars each year to research and implement new technologies. The company's goal is to utilize as much fibre as possible out of each tree. The pursuit of that goal has led the company to install a new 6-in. double cut band mill to improve cutting accuracy and

production. Buchanan Lumber also constructed a finger jointing plant, which allows the mill to take below-average quality inventory and convert it into high-grade and specialty products, recovering approximately 20 million board feet of product per year. The company has also instituted a pre-sorting program that enables it to kiln dry lumber in batches of similar moisture content. This improves the company's drying curve, saves energy and delivers a more consistent final product.

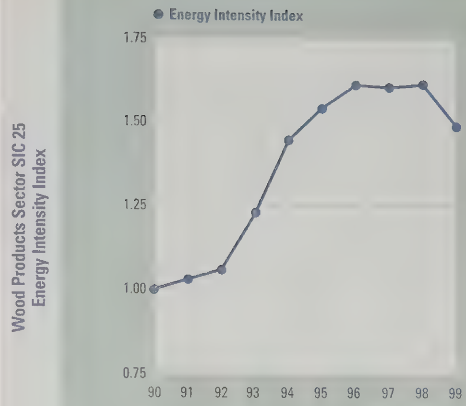
ACHIEVEMENTS The wood products sector consumed 72 263 TJ of fossil fuels and electricity in 1999. Due to strong demand for the industry's products, production has risen 30 percent over the last decade. In turn, this has led to a rise in the total energy consumed by the sector over the same period. However, energy intensity has improved over the last five years.

Rapidly rising energy prices are providing additional incentive for sector companies to implement low-cost energy efficiency measures. The industry continues to look for ways to employ cost-effective biomass energy sources to replace natural gas and electricity. However, adverse national and international economic factors continue to affect both production and energy efficiency efforts and are forcing companies to increase their focus on marketing and product improvement. This trend often leads to greater energy consumption for such measures as kiln drying.

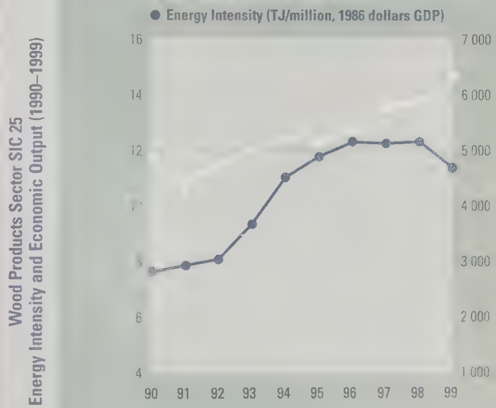
CHALLENGES Establishing meaningful data for the wood products sector is a complicated task. The breadth of products produced by the sector (everything from low-energy intensity shingles to energy-intensive structural products such as new, high-tech-oriented strand boards) makes it difficult to develop meaningful comparisons. Moreover, before 1995, the sector's wood waste for energy use had been attributed to the closely allied pulp and paper industry.

In 1995, energy data collection was refined to differentiate the wood waste used by each sector. While this has resulted in more accurate data for each sector, it has made 1990 an inappropriate base year for current comparisons. Furthermore, many energy efficiency efforts in this sector, such as wood waste cogeneration, are integrated with the pulp and paper sector, making it difficult to segregate energy data.

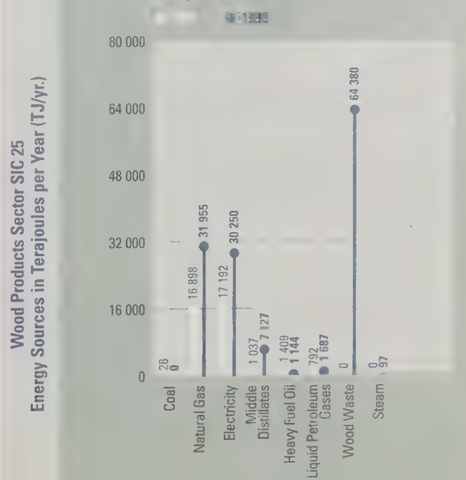
The sector has been working to overcome these issues, and refinements in energy data collection have increased the ability to track the use, not only of purchased energy, but also of internally generated energy. This improves the knowledge of energy use by the wood products sector and has implications for other industrial sectors.



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–1999* January 25, 2001, Simon Fraser University.



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–1999* January 25, 2001, Simon Fraser University.



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–1999.* January 25, 2001, Simon Fraser University.

Through Natural Resources Canada's Office of Energy Efficiency (OEE), the Industrial Energy Innovators Initiative focuses on transforming the sector-level commitments made by the task forces into company-level action by helping to overcome obstacles to energy efficiency at the company level.

As of April 1, 2001, 294 manufacturing and mining companies – representing approximately 80 percent of industrial energy use – have signed on as Industrial Energy Innovators. The majority of these companies are participants in VCR Inc. For information on becoming an Industrial Energy Innovator, contact the OEE by e-mail at cipec.peeic@nrcan.gc.ca.

INDUSTRIAL ENERGY INNOVATORS

Aluminum
Alcan Aluminium Ltd.
Aluminerie Alouette Inc.
Aluminerie de Bécancour Inc.
Aluminerie Lauralco Inc.
Canadian Reynolds Metals Company Limited

Cement
Blue Circle Cement
ESSROC Canada Inc.
Inland Cement Limited
Lafarge Canada Inc.
North Star Cement Ltd.
St. Lawrence Cement Inc.
Tilbury Cement Ltd.

Chemicals
Chinook Group Limited - Sombra Plant
Degussa-Hüls Canada Inc.
DuPont Canada Inc.
Elementis Pigments Canada
MDS Nordion Inc.
Nacan Products Limited
NOVA Chemicals Corporation
OxyVinyls Canada Inc.
Synergistics Industries Limited

Electrical and Electronics
ASCOlectric Ltd.
Broan-NuTone Canada
Camco Inc.
Honeywell Limited
IBM Canada Ltd.
Nortel (Northern Telecom Limited)
Osram Sylvania Ltd.
Siemens - Technologies du Bâtiment Ltée - Landis Division
Vansco Electronics Ltd.

Food and Beverage
Alberta Processing Co., A Division of West Coast Reduction Ltd.
Andrés Wines Ltd.
API Grain Processors
Armstrong Cheese Company Ltd. - Alberta
Big Rock Brewery Ltd.
Black Velvet Distilling Co.
Borden Foods Canada
Canada West Foods J.V. Inc.
Canamera Foods
Canbra Foods Ltd.
Canyon Creek Soup Company Ltd.
Cargill Animal Nutrition - Camrose Plant
Cargill Animal Nutrition - Lethbridge Plant
Casco Inc.
Champion Petfoods
Coca-Cola Bottling Ltd.
Cuddy Food Products
Family Muffins & Desserts Inc.
Fletcher's Fine Foods
Foothills Creamery
Garden Province Meats Inc.
H.J. Heinz Company of Canada Ltd.
Heritage Frozen Foods Ltd.
Hub Meat Packers Ltd. - Sunrise Brand
Kraft Canada Inc.
Labatt Breweries of Canada
Legal Alfalfa Products Ltd.
Lilydale Cooperative Ltd.
Lone Pine Cheese Ltd.
Maple Leaf Consumer Foods
Maple Leaf Pork - Alberta
Maple Leaf Pork - Ontario
Maple Lodge Farms Ltd.
McCain Foods (Canada) - Alberta, A Division of McCain Foods Limited
Molson Breweries - Edmonton Brewery
Molson Canada - Ontario
Moosehead Breweries Ltd.
Nestlé Canada Inc.
Northern Alberta Processing Co., A Division of West Coast Reduction Ltd.
Parmalat Canada Ltd. - Alberta
Pepsi-Cola Canada Beverages
Prairie Mushrooms (1992) Ltd.
Principality Foods Ltd.
Quality Fast Foods
Sakai Spice (Canada) Corporation
Sleeman Brewing and Malting Co. Ltd.
Sunrise Bakery Ltd.
Sun-Rype Products Ltd.
Transfeeder Inc.
Trochu Meat Processors
Unifeed Premix
Versacold Corporation
Westcan Malting Ltd.
Westglen Milling Ltd.
Weston Foods Inc.

Foundry
Ancast Industries Ltd.
Crowe Foundry Limited
Diversa Cast Manufacturing (A Division of Comtech Mfg. Ltd.)
ESCO Limited - Port Hope Operations
Eureka Foundry Corporation (A Subsidiary of ACI Canada Inc.)
Gamma Foundries Limited
Grenville Castings Limited
Wabi Iron & Steel Corporation
Wescast Industries Inc.

General Manufacturing
3M Canada Inc.
ABCO Property Management Inc.
Canadian Uniform Limited
Champion Feed Services Ltd.
Coyle & Greer Awards Canada Ltd.
Crown Cork & Seal Canada Inc.
EMCO Limited - Building Products
Envirogard Products Ltd.
Escalator Handrail Company Inc.
Euclid-Hitachi Heavy Equipment Ltd.

Federated Co-operatives Limited
Ferraz Shawmut Canada Inc.
Fibrex Insulations, Inc.
Garland Commercial Ranges Limited
Greif Containers Inc.
Imperial Home Decor Group Canada Inc.
Imperial Tobacco Canada Limited
Interface Flooring Systems (Canada) Ltd.
International Paper Industries Ltd.
Jones Packaging Inc.
Kindred Industries
Kodak Canada Inc.
LePage (Division of Henkel Canada Limited)
Maksteel Service Centre (Division of Makagon Industries Ltd.)
Marcel Lauzon Inc.
Metroland Printing, Publishing & Distributing Ltd.
Owens Corning Canada - Toronto Plant
Polytainers Inc.
PRO-ECO Limited
Regent Eco Canada
Rohm and Haas Canada Inc.
S.C. Johnson and Son, Limited
Sandvik Tamrock Canada Inc.
Sandvik Tamrock Loaders Inc.
Scapa Tapes North America
Simmons Canada Inc.
Soprema Inc. - Drummondville Plant
Superior Radiant Products Ltd.
Teknion Furniture Systems Inc.
VicWest Steel
Viskase Canada Inc.
Wabash Alloys Ontario
Wyeth-Ayerst Canada Inc.

Lime

Beachville Lime Limited
Chemical Lime Company of Canada Inc.
Dundas Lime Limited
Graymont (NB) Inc.
Graymont (QC) Inc.
Graymont Western Canada Inc.
Northern Lime Limited

Mining

Aur Resources Inc.
Barrick Gold Corporation - La Mine Doyon (Division of Cambior Inc.)
BHP Diamonds Inc.
Boliden Limited
Canadian Electrolytic Zinc Limited
Cominco Ltd.
Echo Bay Mines Ltd. - Lupin Operation
Falconbridge Limited
Fonderie Horne - Métallurgie Noranda inc.
Hillsborough Resources Limited
Hudson Bay Mining & Smelting Co., Ltd.
INCO Limited
International Minerals and Chemicals (Canada) Global Limited (IMC Kalium Canada Ltd.)
Iron Ore Company of Canada
Mines et exploration Noranda inc. - Division Matagami
Mines Wabush (gérées par la Compagnie Minière Cliffs inc.)
Newmont Canada Limited, Golden Giant Mine
Noranda Inc. - Brunswick Mining Division
Noranda Inc. - Brunswick Smelter
Noranda Metallurgy Inc. - Canadian Copper Refinery
Placer Dome Canada Limited
Quebec Cartier Mining Company
Syncrude Canada Ltd.
Teck Corporation

Petroleum Products

Amoco Canada Petroleum Company Limited
Canadian Tire Petroleum
Chevron Canada Limited - Burnaby Refinery
Enbridge Pipelines Inc.
Husky Oil Operations Ltd.
Imperial Oil Limited
Irving Oil Limited
Nova Corporation
Parkland Refining Ltd.
Petro-Canada
Safety-Kleen Corp.
Shell Canada Products Limited
Suncor Energy Inc.-Sunoco Group
Ultramar Ltd. - Saint-Romuald Refinery

Plastics

Downeast Plastics Ltd.
Husky Injection Molding Systems Ltd.
The Clorox Company of Canada, Ltd.

Potash

Potash Corp. of Saskatchewan Inc.
- Allan Division
- Cory Division
- Lanigan Division
- New Brunswick Division
- Patience Lake Division
- Rocanville Division

Pulp and Paper/Forestry

Abitibi-Consolidated Inc.
Bowater Pulp and Paper Canada Inc.
Canfor Corporation
Cariboo Pulp and Paper Company Limited
Daishowa Inc.
Emballages Smurfit-Stone Canada inc. - La Tuque Plant
Eurocan Pulp & Paper Company Limited
F.F. Soucy Inc.
Kruger Inc.
Lake Utopia Paper
Marathon Pulp Inc.
Maritime Paper Products Limited
Nexfor Inc.
Norske Skog Canada Ltd.
Paperboard Industries International Inc. (Division of Cascades Inc.)
Riverside Forest Products Limited, Armstrong Division
St. Marys Paper Ltd.
Stora Enso North America, Port Hawkesbury Mill
Tembec Inc.
Tembec Paper Group - Spruce Falls Operations
UPM-Kymmene Corporation
Weldwood of Canada Limited
West Fraser Timber Co. Ltd.
Weyerhaeuser Canada Ltd.

Rubber

Gates Canada Inc.
Michelin North America (Canada) Inc.
NRI Industries Inc.

Steel

Algoma Steel Inc.
AltaSteel Ltd.
Atlas Specialty Steels (A Division of Slater Stainless Corp.)
CHT Steel Company Inc.
Co-Steel LASCO
Dofasco Inc.
Frost Fence & Wire Products Ltd.
GenFast Manufacturing Co.
Gerdau Courtice Steel Inc.
Hilton Works (A Division of Stelco Inc.)
Ivaco Inc. (Ivaco Rolling Mills)
Lake Erie Steel Company (A Division of Stelco Inc.)
Laurel Steel (Division of Harris Steel Limited)
QIT - Fer et Titane inc.
Slater Steel Inc. - Hamilton Specialty Bar Division
Stelco Inc.
Stelco-McMaster Ltée
Stelfil Ltée
Stelpipe Ltd.
Stelwire Ltd.
Sydney Steel Corporation
Welland Pipe Ltd.

Textiles

Agmont Inc.
Albarrie Canada Limited
Barrday Inc.
Beaulieu Canada Inc.
Bennett Fleet (Quebec) Inc.
Britex Group (The)
C.S. Brooks Canada Inc. (Magog)
Cambridge Towel Corporation (The)
Cavalier Textiles
Coats and Clark Canada
Coats Bell
Collingwood Fabrics Inc.
Collins & Aikman Canada Inc.
Consoltex Inc.
CookshireTex inc.
Denim Swift
Fabrene Inc.
Glendale Yarns Inc. (or Glendale Spinning Mills (1981) Ltd.)
J.L. de Ball Canada Inc.
LaGran Canada Inc.
Lincoln Fabrics Ltd.
Manoir Inc.
Monterey Textiles (1996) Inc.
Nova Scotia Textiles, Limited
PGI-DIFCO Performance Fabrics Inc.
Spinrite Inc.
St. Lawrence Corporation
Stedfast Inc.
Velcro Canada Inc.
VOA Colfab Inc.

Transportation Equipment Manufacturing

Accuride Canada Inc.
Boeing Toronto Limited
Bombardier Inc. - Valcourt Plant
Cami Automotive Inc.
Canadian General-Tower Limited
DaimlerChrysler Canada Inc.
Ford Motor Company of Canada, Limited
General Motors of Canada Limited
Honda of Canada Mfg.
International Truck and Engine Corporation Canada
Oetiker Limited
Orenda Aerospace Corporation
Orion Bus Industries Inc.
Oxford Automotive, Inc. - Suspension Division, Chatham
Polywheels Manufacturing Ltd.
Pratt & Whitney Canada Inc.
Presstran Industries
Prévost Car Inc.
Rockwell Automation Canada Inc.
Russel Metals Inc.
Sterling Trucks, A Division of Freightliner Limited
Toyota Motor Manufacturing Canada Inc.
TRW Automotive
Volvo Cars of Canada Ltd.
Woodbridge Group (The)

NATURAL RESOURCES CANADA STAFF

Jean-Marc Berrouard
Industry Officer
Industrial Energy Efficiency Initiative
Office of Energy Efficiency
Natural Resources Canada
580 Booth Street
Ottawa ON K1A 0E4
Tel.: (613) 943-2224
Fax: (613) 947-4121
E-mail: jberroua@nrcan.gc.ca

Marlene Blakney
Senior Industry Officer
Industrial Energy Efficiency Initiative
Office of Energy Efficiency
Natural Resources Canada
580 Booth Street
Ottawa ON K1A 0E4
Tel.: (613) 996-8278
Fax: (613) 947-4121
E-mail: mblakney@nrcan.gc.ca

Magella Bouffard
Industry Officer
Industrial Energy Efficiency Initiative
Office of Energy Efficiency
Natural Resources Canada
580 Booth Street
Ottawa ON K1A 0E4
Tel.: (613) 996-3799
Fax: (613) 947-4121
E-mail: mbouffar@nrcan.gc.ca

Beryl Broomfield
Program Assistant
Industrial Energy Efficiency Initiative
Office of Energy Efficiency
Natural Resources Canada
580 Booth Street
Ottawa ON K1A 0E4
Tel.: (613) 947-4828
Fax: (613) 947-4121
E-mail: bbroomfi@nrcan.gc.ca

Carol Buckley
Director
Industrial, Commercial and Institutional Programs Division
Office of Energy Efficiency
Natural Resources Canada
580 Booth Street
Ottawa ON K1A 0E4
Tel.: (613) 996-4079
Fax: (613) 947-4121
E-mail: cbuckley@nrcan.gc.ca

Mark Butkus
Writer/Editor
Industrial Energy Efficiency Initiative
Office of Energy Efficiency
Natural Resources Canada
580 Booth Street
Ottawa ON K1A 0E4
Tel.: (613) 943-0125
Fax: (613) 947-4121
E-mail: mbutkus@nrcan.gc.ca

Johanne Geoffrion
Senior Industry Officer
Industrial Energy Efficiency Initiative
Office of Energy Efficiency
Natural Resources Canada
580 Booth Street
Ottawa ON K1A 0E4
Tel.: (613) 992-8003
Fax: (613) 947-4121
E-mail: jgeoffri@nrcan.gc.ca

Philip B. Jago
Chief
Industrial Energy Efficiency Initiative
Office of Energy Efficiency
Natural Resources Canada
580 Booth Street
Ottawa ON K1A 0E4
Tel.: (613) 995-6839
Fax: (613) 947-4121
E-mail: pjago@nrcan.gc.ca

Vaughn Munroe
Senior Industry Officer
Industrial Energy Efficiency Initiative
Office of Energy Efficiency
Natural Resources Canada
580 Booth Street
Ottawa ON K1A 0E4
Tel.: (613) 947-1594
Fax: (613) 947-4121
E-mail: vmunroe@nrcan.gc.ca

Melanie Phillips
Senior Industry Officer
Industrial Energy Efficiency Initiative
Office of Energy Efficiency
Natural Resources Canada
580 Booth Street
Ottawa ON K1A 0E4
Tel.: (613) 995-3504
Fax: (613) 947-4121
E-mail: mphillip@nrcan.gc.ca

Glenda Taylor
Senior Industry Officer
Office of Energy Efficiency
Natural Resources Canada
580 Booth Street
Ottawa ON K1A 0E4
Tel.: (613) 992-3422
Fax: (613) 947-4121
E-mail: gtaylor@nrcan.gc.ca

ASSOCIATION MEMBERS

Aerospace Industries Association of Canada
Alberta Food Processors Association
Aluminium Association of Canada
Automotive Parts Manufacturers' Association
Baking Association of Canada
Canadian Association of Manmade Vitreous Fibre Manufacturers
Canadian Chemical Producers' Association
Canadian Fertilizer Institute
Canadian Foundry Association
Canadian Gas Association
Canadian Lime Institute
Canadian Manufacturers & Exporters (CME)
CME Alberta Division
CME British Columbia Division
CME Manitoba Division
CME New Brunswick Division
CME Newfoundland Division
CME Nova Scotia Division
CME Ontario Division
CME Prince Edward Island Division
Canadian Meat Council
Canadian Petroleum Products Institute
Canadian Plastics Industry Association
Canadian Steel Environmental Committee (Canadian Steel Producers Association)
Canadian Textiles Institute
Canadian Vehicle Manufacturer's Association
Cement Association of Canada
Council of Forest Industries
Electro-Federation Canada
Food and Consumer Products Manufacturers of Canada
Forest Products Association of Canada
Forintek Canada Corporation
Mining Association of Canada
National Dairy Council
Ontario Food Producers' Association
Quebec Forest Industries Association
Rubber Association of Canada
The Canadian Council of Grocery Distributors

GLOSSARY OF TERMS

Annual Census of Mines
NRCan survey that collects information on SIC 06 and SIC 08.

Annual Survey of Manufacturers (ASM)
Statistics Canada survey. Provides information on the consumption of purchased fuels and electricity (cpfe) for approximately 230 subsectors at four-digit SIC code levels.

Base Year
A reference year. For the Framework Convention on Climate Change, 1990 is the base year.

Canada's Climate Change Voluntary Challenge and Registry Inc. (VCR Inc.)
VCR Inc. is a key element of Canada's National Action Program on Climate Change. It encourages the private and public sectors to take voluntary steps to limit or reduce GHG emissions. As a first step, participants are encouraged to submit a letter of intent confirming a commitment to limit or reduce GHGs from their operations. This is followed by an action plan and subsequent progress reports. The Industrial Energy Innovators Initiative provides a means for manufacturing and mining companies to enroll in VCR Inc.

Carbon Dioxide (CO_2)
A compound of carbon and oxygen that, in its normal gaseous state, is clear and colourless. CO_2 is formed whenever carbon-bearing fuels are burned. It can also be formed via other reactions not involving combustion.

Economic Energy Intensity
Energy consumption per unit of economic output.

Embodied Energy
The energy consumed to transform all upstream raw materials into the final product. In a life-cycle approach, it would be the "cradle to grave" energy burden.

Energy Intensity
Energy consumption per unit of output.

energy intensity Indicator
A dimensionless ratio equal to the energy intensity in a particular year divided by the energy intensity of the base year. The energy intensity indicator for the base year equals 1.0.

Energy Performance Measures
Any of a variety of metrics that would indicate an aspect of energy performance.

Framework Convention on Climate Change (FCCC)
United Nations convention to address climate change signed by more than 150 countries at the United Nations Conference on Environment and Development in Rio de Janeiro in June 1992. Canada became the eighth country to ratify the Convention, which entered into force on March 21, 1994, thereby committing to work toward stabilizing GHG emissions at 1990 levels by the year 2000.

Greenhouse Gas (GHG)
A GHG absorbs and radiates heat in the lower atmosphere that otherwise would be lost in space. The greenhouse effect is essential for life on this planet, since it keeps average global temperatures high enough to support plant and animal growth. The main GHGs are carbon dioxide (CO_2), methane (CH_4), chlorofluorocarbons (CFCs) and nitrous oxides (N_2O). By far the most abundant GHG is CO_2, accounting for 70 percent of the greenhouse effect.

Gross Domestic Product (GDP)
The total value of goods and services produced by the nation's economy before deduction of depreciation charges and other allowances for capital consumption, labour and property located in Canada. It includes the total output of goods and services by private consumers and government, gross private domestic capital investment and net foreign trade. GDP figures are reported in real 1986 dollars.

Higher Heating Value
The amount of heat that is obtained when a specified amount of fuel is combusted with its stoichiometrically correct amount of air, both being at 15°C when combustion starts, and the products of combustion being cooled to 15°C before the heat release is measured (also called "gross calorific value" or "gross heating value").

Industrial Consumption of Energy Survey (ICE)
Statistics Canada survey on energy use. Covers purchased and non-purchased energy for approximately 24 industrial subsectors.

Lower Heating Value
The higher heating value minus the latent heat of vaporization of the water vapour formed by the combustion of any hydrogen present in the fuel. For a fuel with no hydrogen, the higher and lower heating values are the same (also called the "lower calorific value" or the "net heating value").

Natural Resources Canada (NRCan)
The predominant natural resources department of the Government of Canada, NRCan has a mandate to promote the sustainable development and responsible use of Canada's mineral, energy and forestry resources and to develop an understanding of Canada's land mass.

Physical Energy Intensity
Energy consumption per unit of physical output.

Quarterly Report on Energy Supply and Demand (QRESD)
Provides an energy balance of all energy consumption in Canada. QRESD data on the manufacturing industries are gathered mainly by the Industrial Consumption of Energy (ICE) survey. These data are supplemented by other surveys on the disposition of energy (from utilities) and the production of petroleum products.

Specific Energy (Consumption)
Energy consumption per physical unit of output (also called "physical energy intensity").

Standard Industrial Classification (SIC)
Statistics Canada uses a classification system that categorizes establishments into groups with similar economic activities.

Statistics Canada
Statistics Canada is the country's national statistical agency, with programs organized into three broad subject areas: demographic and social, socio-economic and economic. Under the *Statistics Act*, Statistics Canada is required to collect, compile, analyse, abstract and publish statistical information on virtually every aspect of the nation's society and economy. All information given to Statistics Canada through surveys, the census or any other source is confidential. Statistics Canada does not release any information that identifies an individual or organization.

Tier I
Informal designation by CIPEC of industries that are major energy-consuming industries. The seven designated Tier I industries are pulp and paper, petroleum refining, cement, mining, steel, chemicals and aluminum. The Tier I industries account for approximately 80 percent of total Canadian industrial energy consumption.

Tier II
Informal designation by CIPEC of industries that are minor energy-consuming industries (relative to Tier I industries) but contribute substantially to Canadian industrial GDP. Tier II industries account for 60 percent of Canadian industrial GDP.

CIPEC

For more information or to receive additional copies of this publication, write to

Canadian Industry Program for Energy Conservation
c/o Natural Resources Canada
Office of Energy Efficiency
580 Booth Street, 18th Floor
Ottawa, ON K1A 0E4

Tel.: (613) 995-6839
Fax: (613) 947-4121
E-mail: cipec.peeic@nrcan.gc.ca

OEE

Office of Energy Efficiency
Office de l'efficacité énergétiq

Leading Canadians to Energy Efficiency at Home, at Work and on the Road

The Office of Energy Efficiency of Natural Resources Canada is a dynamic organization with a mandate to renew, strengthen and expand Canada's commitment to energy efficiency in order to help address the challenges of climate change.

CIPEC

Canadian Industry Program for

ENERGY CONSERVATION

2000/2001 ANNUAL REPORT

Natural Resources Canada
Ressources naturelles Canada

Canada

National Library of Canada cataloguing in publication data

Canadian Industry Program for Energy Conservation (CIPEC)

2000/2001 annual report

Annual.
Title from cover.
ISBN 0-662-32224-X
Cat. No. M92-143/2001-1E
ISSN 0846-9474

1. Energy conservation – Canada – Periodicals.
2. Energy policy – Canada – Periodicals.
3. Energy consumption – Canada – Periodicals.
I. Canada. Natural Resources Canada.

TJ163.4C3C32 2002 333.791'6'0971

For more information or to receive additional copies
of this publication, write to

Canadian Industry Program for Energy Conservation
c/o Natural Resources Canada
Office of Energy Efficiency
580 Booth Street, 18th Floor
Ottawa ON K1A 0E4
Tel.: (613) 995-6839
Fax: (613) 947-4121
E-mail: cipec.peeic@nrcan.gc.ca
Web site: http://oee.nrcan.gc.ca/cipec

PRINTED IN CANADA IMPRIMÉ AU CANADA

Printed on recycled paper

OUR MISSION

To promote effective voluntary action that reduces industrial energy use per unit of production, thereby improving economic performance while participating in meeting Canada's climate change objectives.

CIPEC

2000/2001 ANNUAL REPORT

Success Stories

Sector Reports

CHAIRMAN'S LETTER

CIPEC

The Honourable Herb Dhaliwal
Minister of Natural Resources Canada
Ottawa ON K1A 0A6

Dear Minister:

I am honoured to present, once again, the Canadian Industry Program for Energy Conservation's (CIPEC's) *2000/2001 Annual Report*.

I am pleased to report that CIPEC industries continued to make a positive contribution to Canada's efforts to achieve greater energy efficiency and reduced greenhouse gas (GHG) emissions. Between 1990 and 2000, these industries achieved an average annual aggregate energy intensity improvement of 2.4 percent. This represents an energy saving that is equivalent to 95 percent of Canada's residential heating demand in 2000 and contributed significantly to the estimated $1.8 billion in fuel costs saved by Canadian industry through effective energy management in the year 2000.

These energy savings have also had substantial environmental benefits, making a significant contribution to Canada's efforts to meet its international climate change goals. Energy-related GHG emissions have essentially stabilized at 1990 levels for the period 1990–2000. Had there been no energy intensity improvement between 1990 and 2000, Canada's GHG emissions in 2000 would have been 27 percent higher. Once again, CIPEC has demonstrated that voluntary cooperation between business and government can be a powerful ally in Canada's environmental mission.

CIPEC also brings great value to participating industries. The energy savings that companies have achieved through the CIPEC program also represent cost savings – money that translates into improved competitiveness and a healthier bottom line. CIPEC's ability to contribute to business success is the main reason that the organization now encompasses 25 industrial sectors, 43 trade associations and more than 95 percent of Canada's overall industrial energy demand.

CIPEC's efforts to promote "more active companies in the program, and more active programs in the companies" are bearing fruit. Sector conferences and workshops, which provide the tools and information that companies need to launch and reinforce energy efficiency activities, continue to surge in popularity. A further 28 companies joined the Industrial Energy Innovators program since this report was last submitted, bringing the total number of organizations participating in this program to 314. For the first time, we report on the efforts of the upstream oil and gas sector and the electricity generation sector, both of which joined CIPEC in 2001.

As I will shortly be relinquishing my duties with Falconbridge in favour of other pursuits, I will also be stepping down as Chair of CIPEC. I have enjoyed working with the Government of Canada on this unique and vital partnership. I would like to express my appreciation for the new resources you have allocated for the years ahead through the *Government of Canada Action Plan 2000 on Climate Change*. I am certain that with government and industry working together, Canada will continue to make strong progress toward its climate change goals.

W. Warren Holmes
Senior Vice-President, Canadian Mining Operations, Falconbridge Ltd.
Chair, CIPEC Executive Board

HOW CIPEC WORKS

CIPEC is an umbrella organization overseeing a partnership between government and private industry aimed at improving Canada's industrial energy efficiency. CIPEC comprises sectoral task forces, each of which represents companies engaged in similar industrial activities that participate through their trade associations. The Task Force Council, with representatives from each CIPEC sector, provides a common forum for sectors to share issues and recommend ways to address common needs. Overall direction is provided by an Executive Board made up of private-sector leaders committed to industrial energy efficiency.

CIPEC's extraordinary public-private relationship is successful because it is built not on government regulation, but on trust. In the CIPEC partnership, voluntary change emerges from consensus and joint action built through open and honest communication.

CIPEC continues to be the focal point for industry's response to Canada's climate change efforts. Our role is to promote the evolution of energy efficiency and to identify and reward those who lead the way.

We carry out this mandate in part through a strong communications and awareness program grounded in our twice-monthly *Heads Up CIPEC* newsletter and in regular features in selected trade magazines. *Heads Up CIPEC*, which was first published in 1997 with a circulation of 55, now has more than 2500 subscribers in more than 1300 organizations and boasts a total readership of almost 10 000. Our communications programs celebrate energy efficiency innovations and the industry leaders behind them and provide ideas to improve business and economic benefits through reductions in energy use.

CIPEC also raises awareness of the goals and benefits of improved energy use in other ways. Non-competitive information is exchanged at regular sector task force meetings. The Task Force Council and individual sectors are constantly at work to broaden participation and to bolster public and industry awareness of the role and achievements of CIPEC industries.

CIPEC volunteers include successful business leaders and others recognized on the national stage. The quality and profile of these leaders and their strong belief in voluntary action without government regulation give CIPEC a strong edge in attracting new industry participants and in continuing the successful partnership between industry and government.

A UNIQUE VOLUNTARY PARTNERSHIP

The Canadian Industry Program for Energy Conservation (CIPEC) continued to extend its remarkable partnership between business and government during 2000. Canadian industrial establishments turned to CIPEC in record numbers for leadership, guidance and support in their efforts to manage energy more efficiently.

CIPEC remains a unique example of what can be accomplished through voluntary cooperation when public- and private-sector interests converge. The program's unrivalled track record has set the standard for organizations of its type throughout the world.

Here are a few of the organization's most significant achievements:

- Companies under the CIPEC umbrella achieved an energy intensity improvement of 2.4 percent per year between 1990 and 2000, well above the 1-percent-per-annum improvement commitment made in 1994. The total energy saved by CIPEC industries during 2000 is equivalent to 95 percent of Canada's residential heating demand in 2000, and it contributed significantly to the estimated $1.8 billion in fuel costs saved by Canadian industry through effective energy management in the year 2000.

- Effective energy management by CIPEC industries has contributed to a healthier environment. While energy-related GHG emissions were up 1.7 percent in 2000, CIPEC industries outperformed other sectors of the economy during the year. In fact, without the strong energy intensity improvements made by companies involved with CIPEC, industrial emissions for the decade would have been 27 percent higher.

- Five new trade associations signed letters of cooperation with CIPEC, bringing total participation to 43 associations. Collectively, these groups represent more than 95 percent of secondary industrial energy demand. Significantly, three of these associations represent energy suppliers, including the Canadian Association of Petroleum Producers, the Small Explorers and Producers Association of Canada and the Canadian Electricity Association.

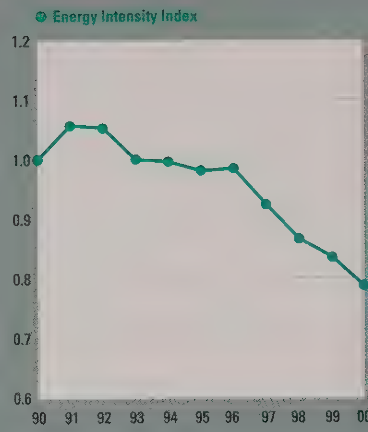
- There are now 25 CIPEC task forces, as CIPEC has extended its scope beyond mining and manufacturing to include a wider spectrum of Canadian industry.

- By the end of 2001, 314 companies had become Industrial Energy Innovators, an increase of 28 companies from the previous year. The continuing willingness of Canadian companies to become Industrial Energy Innovators points to the direct relationship between sound energy management and business success.

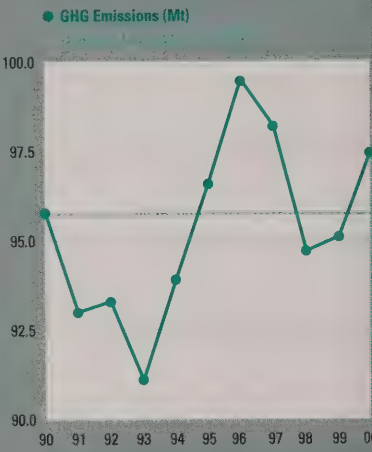
THE EVOLUTION OF CIPEC DATA

Accurate measurement and meaningful data are fundamental to measuring energy efficiency improvements. The data used in this report are collected by Statistics Canada and interpreted by the Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC) at Simon Fraser University in Burnaby, British Columbia. From Statistics Canada data, CIEEDAC produces energy intensity indicators for each sector based on production and GDP. CIPEC continues to collaborate with Statistics Canada and CIEEDAC in ongoing efforts to ensure measurement accuracy and acceptability.

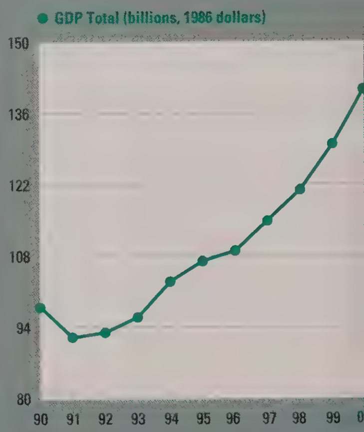
The cooperative CIEEDAC system is internationally recognized for its methodologies, data integrity and cooperation with CIPEC. Primary funding for CIEEDAC comes from Natural Resources Canada, with additional contributions from industry associations that participate in CIPEC and the province of Quebec.



CIPEC Aggregate Energy Intensity Index 1990–2000
Base Year 1990 (1.00)



CIPEC Aggregate Energy-Based Greenhouse Gas
Emissions (No Electricity Emissions) 1990–2000



CIPEC Economic Growth: Aggregate GDP
(billions, 1986 dollars) 1990–2000

• According to Natural Resources Canada's (NRCan's) statistics, while energy use by CIPEC industries increased 13 percent between 1990 and 2000, their gross domestic product (GDP) rose by 44 percent. This points to a significant reduction in energy intensity across Canada's entire spectrum of industry. Simply put, it takes a lot less energy today to produce a dollar value of product than it did at the beginning of the 1990s.

Industry has embraced CIPEC because of a growing realization that what is good for the environment can also be good for business. Sector by sector and company by company, manufacturing and mining companies are making intelligent, voluntary energy management decisions to adopt energy-saving technology and efficient new processes. Across the nation, these decisions are helping participating businesses to cut costs and increase profits. Combined on a national scale, these actions are reducing Canada's energy consumption and GHG emissions and helping the country to meet its international climate change goals.

GROWING SUCCESS FOR CIPEC

CIPEC's current three-year mandate is to promote "more active companies in the program, and more active programs in the companies." Efforts toward this goal are paying off. CIPEC's growth continued unabated in 2000, and participation in the program is at an all-time high.

To bring new, active companies into the energy efficiency fold, CIPEC added new sector task forces that cover electricity generation, construction and upstream oil and gas and will seek to further extend its reach. CIPEC can now be considered the energy efficiency focal point for all of Canadian industry.

Efforts to encourage more active programs in Industrial Energy Innovator companies have been equally fruitful. Attendance at CIPEC-sponsored energy conferences is surging, and company representatives attending these events are applying what they learn to improve the energy efficiency of their organizations. Moreover, in conjunction with NRCan's Office of Energy Efficiency, workshops are now available to individual companies for presentation to operations and maintenance personnel at company facilities, thereby extending energy efficiency initiatives to the shop floor.

Individual companies are employing ingenious concepts to further energy efficiency. For example, DuPont Canada Inc. has adopted an innovative financing method that takes energy efficiency investments off the balance sheet and pays for capital improvements with the savings they generate. With energy investment capital being difficult to find for many companies, innovative financing strategies offer an opportunity to gain the benefits of energy efficiency without taxing what may be limited financial resources.

GROWING EXCELLENCE

Many companies active in CIPEC sectors achieved energy efficiency excellence in 2000/2001. Twelve such companies are highlighted in the "Success Stories" section of this report. In addition, 30 companies have been awarded Champion Reporter status by Canada's Climate Change Voluntary Challenge and Registry Inc. (VCR Inc.) during the past year. Overall, 65 Industrial Energy Innovator companies have earned Champion Reporter status with VCR Inc.

The excellence of the CIPEC concept and its ability to instigate positive change was affirmed when India chose the CIPEC model as the basis for the Indian Industrial Programme for Energy Conservation (IIPEC). The initiative is part of the India Facilitation of Private Sector Development Project, a joint effort of the governments of India and Canada. The Federation of Indian Chambers of Commerce and Industry and the Indian Ministry of Power are working together to implement the initiative. Following CIPEC's lead, IIPEC will establish a series of energy management sector task forces, made up of representatives from various industries. Initial IIPEC task forces will include cement, pulp and paper, and textiles. Representatives of the Indian program toured Canada and the facilities of CIPEC partners in April 2002.

NEW LEADERSHIP

After 20 years with the CIPEC program and 16 years as Chair of the Task Force Council, W. Peter Torbet has decided to step down. CIPEC has grown dramatically on Peter's watch, and his contribution to the organization's success is beyond measure.

Replacing Peter as Chair is Susan Olynyk. Sue, a Senior Energy Specialist with Dofasco Inc., has been a Task Force Council member and active CIPEC participant for more than eight years.

NEW FUNDING AND NEW TOOLS

In November 2001, the Government of Canada bolstered its commitment to address climate change by announcing 28 specific actions designed to cut Canada's GHG emissions by more than 23.7 megatonnes by 2010. The projects are part of the Government of Canada's $1.1-billion commitment to action on climate change announced in its 2000 budget.

CIPEC's growing success in fostering industrial energy efficiency has led the Government of Canada to earmark substantial funding for practical tools and initiatives that support the efforts of companies under the CIPEC umbrella. These programs include support for the following:

- Improved tracking and reporting of energy efficiency and emissions trends to encourage industry to pursue climate-change-related activities and help the Government of Canada to identify promising emissions-reduction opportunities.

- Emissions benchmarking studies to help companies to assess their energy efficiency and GHG-emissions performance relative to comparable operations.

- Energy efficiency audits to provide financial assistance and guidance to Industrial Energy Innovator companies that are conducting on-site audits to identify energy efficiency opportunities.

- Awareness building to provide tools such as customized energy management workshops, technical support, guidebooks and videos to small- and medium-sized enterprises to expand awareness of the benefits of reducing GHG emissions.

In addition, CIPEC was allocated additional funding to enable it to add the electricity generation, construction, forestry, and upstream oil and gas sectors to its list of participating industries. The Government of Canada's announcement also included funding for innovation in GHG-reduction and carbon dioxide (CO_2) storage technologies, support for programs that promote GHG credits, and the development of ethanol fuels from biomass.

These programs and their associated investments will help Canadian industry build on the momentum toward energy efficiency it has already established. CIPEC is proud of its contribution to this effort.

SUSTAINING CIPEC'S MOMENTUM

CIPEC's mission remains the same: to promote, encourage and foster energy efficiency improvements and GHG-emissions reductions through voluntary action throughout Canada's industrial sectors. With the vast majority of Canadian industry now covered by the CIPEC umbrella, efforts to deepen the commitment by individual companies to increased energy efficiency are vital to sustaining CIPEC's momentum.

The task is a challenging one. Operations that are seeking to invest in new energy-related technologies must compete for limited funds with other corporate activities, and CIPEC must continue to provide programs that support their efforts to demonstrate that these technologies will bring adequate returns as well as environmental benefits. CIPEC's relevance has been built on its ability to offer innovative, cost-effective energy management concepts and to demonstrate effectively the relationship between energy efficiency and business success.

Although the task is formidable, CIPEC has proven over more than 25 years that it is up to the challenge. The enthusiasm, dedication and commitment demonstrated on both sides of this unique private- and public-sector partnership has enabled the program to overcome many obstacles in the past. Going forward, the additional funding, new initiatives and expanded sector participation announced in 2001 prepares the program for the demands of the future. These tools ensure that CIPEC is, and will continue to be, a strong and vital contributor to Canada's efforts to meet its international climate change goals.

INNOVATION AND CANADA'S CLIMATE CHANGE VOLUNTARY CHALLENGE AND REGISTRY INC. (VCR INC.)

The Industrial Energy Innovators program helps companies put sector-level commitments into action at the individual corporate level. At the time this report was being written, 314 companies representing approximately 85 percent of industrial energy use in Canada had signed on as Industrial Energy Innovators. Most of these companies are participants in VCR Inc., a non-profit partnership between industry and government across Canada. VCR Inc. provides the means for promoting, assessing and recognizing the effectiveness of the voluntary approach in addressing climate change.

CIPEC has strengthened the participation of Industrial Energy Innovators in VCR Inc. through a number of programs. These include programs to increase awareness of the economic benefits of improved energy use and tools to remove barriers that hinder energy management improvement projects within companies. CIPEC believes that parallel efforts among like-minded organizations are needed to maximize Canada's industrial energy efficiency.

CIPEC TASK FORCE COUNCIL

Aluminum Sector Task Force
Christian Van Houtte
President
Aluminium Association of Canada
1010 Sherbrooke Street West, Suite 1600
Montréal QC H3A 2R7
Tel.: (514) 288-4842
Fax: (514) 288-0944
E-mail: associa@aluminium.qc.ca

Brewers Sector Task Force
Margo Dewar
Vice-President, Economic Policy and Programs
Brewers Association of Canada
100 Queen Street, Suite 650
Ottawa ON K1P 1J9
Tel.: (613) 232-9601
Fax: (613) 232-2283
E-mail: mdewar@brewers.ca

Cement Sector Task Force
Christian Douvre
Vice-President, Performance and Technical Assistance
Lafarge North America
6150 Royalmount Avenue
Montréal QC H4P 2R3
Tel.: (514) 738-3565
Fax: (514) 738-1124
E-mail: Christian.Douvre@lafarge-na.com

Chemical Sector Task Force
Canadian Chemical Producers' Association
350 Sparks Street, Suite 805
Ottawa ON K1R 7S8
Tel.: (613) 237-6215
Fax: (613) 237-4061
E-mail: info@ccpa.ca

Note: As CIPEC-related duties are divided among several staff members, please contact the CCPA and your inquiry will be directed appropriately.

CIPEC Annual Report
Bob Clapp
Vice-President, Ontario Division
Canadian Petroleum Products Institute
20 Adelaide Street East, Suite 901
Toronto ON M5C 2T6
Tel.: (416) 492-5677, Ext. 33
Fax: (416) 492-2514
E-mail: bobclapp@cppi.ca

CIPEC Communications Committee
Ed Gregory
Librarian, Information Specialist
Brewers Association of Canada
100 Queen Street, Suite 650
Ottawa ON K1P 1J9
Tel.: (613) 232-9601
Fax: (613) 232-2283
E-mail: egregory@brewers.ca

CIPEC Task Force Council Chair
Susan Olynyk
Senior Energy Specialist
Dofasco Inc.
1330 Burlington Street
P.O. Box 2460
Hamilton ON L8N 3J5
Tel.: 1 800 363-2726, Ext. 6107
Fax: (905) 548-4267
E-mail: susan_olynyk@dofasco.ca

Construction Sector Task Force
Jeff Morrison
Director of Public Relations
Canadian Construction Association
75 Albert Street, Suite 400
Ottawa ON K1P 5E7
Tel.: (613) 236-9455
Fax: (613) 236-9526
E-mail: jeff@cca-acc.com

Dairy Sector Task Force
Gavin Wells
Corporate Energy Manager
Parmalat Dairy and Bakery Inc.
25 Rakely Court
Etobicoke ON M9C 5G2
Tel.: (416) 641-2943
Fax: (416) 622-4180
E-mail: gavin_wells@parmalat.ca

Electrical and Electronics Sector Task Force
Steve Horvath
Horvath Consultants
71 Truman Road
North York ON M2L 2L7
Tel.: (416) 575-2335
E-mail: brenda.horvath@sympatico.ca

Electricity Generation Sector Task Force
Valerie Snow
ECR Program Manager
Canadian Electricity Association
1155 Metcalfe Street, Suite 1120
Montréal QC H3B 2V6
Tel.: (514) 576-9193
Fax: (514) 489-7406
E-mail: snow@canelect.ca

Fertilizer Sector Task Force
David Finlayson
Director, Technical Affairs
Canadian Fertilizer Institute
350 Sparks Street, Suite 802
Ottawa ON K1R 7S8
Tel.: (613) 230-2597
Fax: (613) 230-5142
E-mail: dfinlayson@cfi.ca

Food and Beverage Sector Task Force
Walter Kraus
Director, Environmental Affairs
George Weston Ltd. / Loblaw Companies Ltd.
22 St. Clair Avenue East, Suite 1901
Toronto ON M4T 2S8
Tel.: (416) 922-1383, Ext. 5414
Fax: (416) 922-4395
E-mail: walter.kraus@weston.ca

Foundry Sector Task Force
Judith Arbour
Executive Director
Canadian Foundry Association
1 Nicholas Street, Suite 1500
Ottawa ON K1N 7B7
Tel.: (613) 789-4894
Fax: (613) 789-5957
E-mail: judy@foundryassociation.ca

Foundry Sector Task Force
Adam Promoli
Project Manager
Crowe Foundry Limited
95 Sheffield Street
P.O. Box 25010
Cambridge ON N3C 4B1
Tel.: (519) 658-9376, Ext. 241
Fax: (519) 658-6190
E-mail: adam@crowefoundry.com

General Manufacturing Sector Task Force – Central
Derek Holden
Retired Chief Executive Officer
c/o Owens Corning Canada Inc.
71 Heatherwood Crescent
Unionville ON L3R 8V6
Tel.: (905) 479-7279
Fax: (905) 479-6760
E-mail: djholden@home.com

General Manufacturing Sector Task Force – East
André Desroches
Vice-President, Fabrication, Eastern Canada
EMCO Limited – Building Products
9510 Saint-Patrick Street
LaSalle QC H8R 1R9
Tel.: (514) 364-7528
Fax: (514) 364-4487
E-mail: ades@emcoltd.com

General Manufacturing Sector Task Force – West
Jim Wilson
Plant Manager
Owens Corning Canada Inc.
831 Hayter Road
P.O. Box 595
Edmonton AB T5J 2L1
Tel.: (780) 472-5882
Fax: (780) 472-6601
E-mail: jim.wilson@owenscorning.com

Lime Sector Task Force
Dick Bowman
General Manager
Beachville Lime Limited
P.O. Box 98
Ingersoll ON N5C 3K1
Tel.: (519) 423-6283, Ext. 290
Fax: (519) 423-6135
E-mail: dick.bowman@carmeusena.com

Meat Sector Task Force
Brad Erhardt
Manager of Environmental Affairs
Schneider Foods
321 Courtland Avenue East
Kitchener ON N2G 3X8
Tel.: (519) 741-5000, Ext. 7883
Fax: (519) 749-7409
E-mail: berhardt@jms.ca

Mining Sector Task Force
Lauri Gregg
Director, Energy and Technical Services
Falconbridge Limited
95 Wellington Street West, Suite 1200
Toronto ON M5J 2V4
Tel.: (416) 956-5752
Fax: (416) 956-5839
E-mail: lgregg@falconbridge.com

Oil Sands Sector Task Force
Kees Versfeld
Energy Management Leader
Syncrude Canada Ltd.
P.O. Box 4009, Mail Drop #2030
Fort McMurray AB T9H 3L1
Tel.: (780) 790-8605
Fax: (780) 790-4875
E-mail: versfeld.kees@syncrude.com

Petroleum Products Task Force
Jack Belletrutti
Vice-President
Canadian Petroleum Products Institute
275 Slater Street, Suite 1000
Ottawa ON K1P 5H9
Tel.: (613) 232-3709, Ext. 209
Fax: (613) 236-4280
E-mail: jackbelletrutti@cppi.ca

Pulp and Paper Sector Task Force
Catherine Cobden
Vice-President, Environment
Forest Products Association of Canada
55 Metcalfe Street, Suite 1380
Ottawa ON K1P 6L5
Tel.: (613) 563-1441
Fax: (613) 563-4720
E-mail: ccobden@fpac.ca

Rubber Sector Task Force
Glenn Maidment
President
The Rubber Association of Canada
2000 Argentia Road
Plaza 4, Suite 250
Mississauga ON L5N 1W1
Tel.: (905) 814-1714
Fax: (905) 814-1085
E-mail: glenn@rubberassociation.ca

Soft Drink Sector Task Force
Anthony Van Heyningen
Director, Research and Policy
Canadian Soft Drink Association
121 Richmond Street West, Suite 901
Toronto ON M5H 2K1
Tel.: (416) 362-2424
Fax: (416) 362-3229
E-mail: anthony@softdrink.ca

Steel Sector Task Force
Susan Olynyk
Senior Energy Specialist
Dofasco Inc.
1330 Burlington Street
P.O. Box 2460
Hamilton ON L8N 3J5
Tel.: 1 800 363-2726, Ext. 6107
Fax: 1 (905) 548-4267
E-mail: susan_olynyk@dofasco.ca

Textiles Sector Task Force
Peter Chantraine
Manager, Energy and Environment
DuPont Canada Inc.
455 Front Road
P.O. Box 2100
Kingston ON K7L 4Z6
Tel.: (613) 548-5025
Fax: (613) 548-5356
E-mail: peter.chantraine@can.dupont.com

Transportation Equipment Manufacturing Sector Task Force
Paul Hansen
Manager, Environmental Affairs
DaimlerChrysler Canada Inc.
2545 Chrysler Centre (CIMS 232-02-02)
Windsor ON N9A 4H6
Tel.: (519) 973-2864
Fax: (519) 973-2613
E-mail: plh2@daimlerchrysler.com

Upstream Oil and Gas Sector Task Force
Gary Webster
Manager, Environment and Health
Canadian Association of Petroleum Producers
350 – 7th Avenue Southwest, Suite 2100
Calgary AB T2P 3N9
Tel.: (403) 267-1146
Fax: (403) 266-3214
E-mail: webster@capp.ca

Canada's Climate Change Voluntary Challenge and Registry Inc. (VCR Inc.)
Bob Flemington
President
VCR Inc.
170 Laurier Avenue West, Suite 600
Ottawa ON K1P 5V5
Tel.: (613) 565-5151
Fax: (613) 565-5743
E-mail: rflemington@vcr-mvr.ca

Wood Products Sector Task Force
Jean-Claude Mercier
Vice-President, Eastern Division
Forintek Canada Corp.
319 Franquet Street
Sainte-Foy QC G1P 4R4
Tel.: (418) 659-2647
Fax: (418) 659-2922
E-mail: jean-claude.mercier@qc.forintek.ca

CIPEC EXECUTIVE BOARD

Peter Birnie
Vice-President
Wabi Iron & Steel Corporation
330 Broadwood Avenue
P.O. Box 1510
New Liskeard ON P0J 1P0
Tel.: (705) 647-4383
Fax: (705) 647-6954
E-mail: pbirnie@wabicorp.com

Peter H. Cooke
Executive Vice-President – Cement
Lafarge Corporation
12950 World Gate Drive, Suite 500
Herndon VA 20170
U.S.A.
Tel.: (703) 480-3660
Fax: (703) 480-1636
E-mail: peter.cooke@lafargecorp.com

T. Reginald Driscoll
President
Albarrie Canada Limited
85 Morrow Road
Barrie ON L4N 3V7
Tel.: (705) 737-0551
Fax: (705) 737-4044
E-mail: albarrie@albarrie.com

Daniel Gagnier
Vice-President
General and Environmental Affairs,
Health and Safety
Alcan Inc.
1188 Sherbrooke Street West
Montréal QC H3A 3G2
Tel.: (514) 848-8118
Fax: (514) 848-1494
E-mail: daniel.gagnier@alcan.com

Warren Holmes
Senior Vice-President
Canadian Mining Operations
Falconbridge Limited
95 Wellington Street West, Suite 1200
Toronto ON M5J 2V4
Tel.: (416) 956-5793
Fax: (416) 956-5777
E-mail: wholmes@falconbridge.com

Paul A. Kelly
President and Chief Executive Officer
Slater Steel Inc.
Markborough Place
6711 Mississauga Road, Suite 202
Mississauga ON L5N 2W3
Tel.: (905) 567-1822
Fax: (905) 567-0946
E-mail: paulkelly@slatersteel.com

Hugh Klaassen
Corporate Operating Officer
Paramount Resources Ltd.
8888 – 3rd Street S.W., Suite 4700
Calgary AB T2P 5C5
Tel.: (403) 290-3671
Fax: (403) 264-9205
E-mail: hugh.klaassen@paramountres.com

Kevin Lyden
President
UPM-Kymmene Inc.
999 Oakmont Plaza Drive
Westmont IL 60559
U.S.A.
Tel.: (630) 850-4932
Fax: (630) 850-3511
E-mail: carolee.rabjohns@upm-kymmene.com

Brenda MacDonald
President
Coyle & Greer Awards Canada Ltd.
4819 Mossley Drive
P.O. Box 247
Mossley ON N0L 1V0
Tel.: (519) 269-3000, Ext. 233
Fax: (519) 269-3038
E-mail: bmacdonald@coylegreer.com

David Matchett, P.Eng.
Director, Environment & Safety
Beachville Lime Limited
P.O. Box 190
Oxford County Road #6
Ingersoll ON N5C 3K5
Tel.: (519) 423-6283, Ext. 241
Fax: (519) 423-6545
E-mail: david.matchett@carmeusena.com

Geoffrey H. Moore
President
Fibrex Insulations, Inc.
561 Scott Road
P.O. Box. 2079
Sarnia ON N7T 7L4
Tel.: (519) 336-7770
Fax: (519) 336-1634
E-mail: gmoore@fibrex.org

Timothy D. Moore
President & General Manager
The Clorox Company of Canada, Ltd.
5700 Yonge Street, Suite 1212
Toronto ON M2M 4K2
Tel.: (416) 221-3373
Fax: (416) 221-3238
E-mail: Tim.D.Moore@clorox.com

Ronald C. Morrison
Treasurer of the Board
Canadian Manufacturers & Exporters
1377 Hazelton Boulevard
Burlington ON L7P 4V2
Tel.: (905) 464-5887
Fax: (905) 335-0523
E-mail: rcm161@aol.com

John D. Redfern
Chairman of the Board
Lafarge Canada Inc.
606 Cathcart Street, 8th Floor
Montréal QC H3B 1L7
Tel.: (514) 861-1411, Ext. 3202
Fax: (514) 876-8900
E-mail: john.redfern@lafarge.ca

Douglas E. Speers
President and Chief Executive Officer
EMCO Limited
620 Richmond Street
P.O. Box 5252
London ON N6A 4L6
Tel.: (519) 645-3900
Fax: (519) 645-2465
E-mail: dspeers@emcoltd.com

Andrew Stephens
Vice-President
Refining and Supply
Petro-Canada
2489 North Sheridan Way
Mississauga ON L5K 1A8
Tel.: (905) 804-4565
Fax: (905) 804-4644
E-mail: stephens@petro-canada.ca

Norman J. Stewart
Vice-President, Government Relations &
General Counsel
Ford Motor Company of Canada, Limited
The Canadian Road
Oakville ON L6J 5E4
Tel.: (905) 845-2511, Ext. 1104
Fax: (905) 845-5759
E-mail: nstewart@ford.com

CIPEC

Canadian Industry Program for

ENERGY CONSERVATION

2000/2001 SUCCESS STORIES

A Record of Achievement

Interest in further improving energy efficiency is thriving as manufacturing and mining companies increasingly recognize the direct relationship between energy efficiency and operating results. Initiatives from nearly every industrial sector across the land are improving energy efficiency, cutting GHG emissions, and helping Canada to meet its international climate change commitments.

In this section, we highlight the recent efforts of 12 companies that have made energy efficiency a key component of their strategic thinking – and a way of life in their operations. Their achievements are representative of the hundreds of success stories that are emerging within the CIPEC family. We present these stories in the hope that they will inspire others to advance energy efficiency programs within their organizations.

After all, it is only through the willingness of individual enterprises to embrace innovation and to adopt new methods and technologies that CIPEC will remain a shining example of voluntary, cross-sectoral co-operation. Through such innovation, the industrial sector will continue to do its part to help Canada achieve its objectives as set out in the Kyoto Protocol.

Photo courtesy of Alcan Inc.

Alcan Inc. on Target to **Reduce GHG Emissions** at State-of-the-Art Facility

Alcan's new $1.6-billion smelter in Alma, Quebec, is the company's first expansion in primary-metals production in two decades and marks the culmination of a rebuilding program begun in the late 1980s. On schedule to be at full production in the third quarter of 2001, the 400 000-tonne Alma smelter, which incorporates the latest energy efficiency technologies, will replace the company's nearby 75 000-tonne facility in Isle-Maligne, Quebec.

The massive plant will require 620 megawatts of power to operate, all of which will be provided by hydro-electricity. Half of the power will come from Alcan's own hydro-electric grid, with the balance provided by Hydro-Québec. Using hydro-electricity will enable the plant to emit only 15 percent of the greenhouse gases (GHGs) produced by typical smelters around the world that use fossil fuel-generated power.

In recent years, Alcan has devoted considerable effort to identify sources of GHG emissions throughout its operations. This has enabled the company to modify practices and introduce new, high-performance technologies at its smelters. The Alma facility carries on this tradition. In fact, by incorporating technologies that enable better control of anode effects, the Alma plant will emit only one tenth of the polyfluorocarbons produced at the Isle-Maligne facility. There is little doubt that the state-of-the-art Alma facility, in addition to the company's recently adopted TARGET program, will enable Alcan to take a giant stride toward its goal of reducing its GHG emissions.

Riding the Wave of **Energy Efficiency at** Connors Bros. Limited

Waste is a four-letter word at **Connors Bros.** The sardine cannery in Blacks Harbour, New Brunswick, has made reducing waste of all kinds a company-wide mandate, going so far as using once-discarded process by-products to create valuable fish meal, fish oil and fertilizer. Since it installed its first power factor controllers in the mid-1970s, the company has been committed to energy efficiency. For example, the company now pumps in seawater to use as a coolant in the plant's air-conditioning system, thereby dramatically reducing the demand for fresh water. A lighting retrofit program has been underway over the past three years, with T-8 fluorescent lamps and compact fluorescents installed in areas throughout the plant.

Beginning in 2000, Connors Bros. initiated improvements to its energy monitoring and tracking system. To further these efforts, the company participated in a "Dollars to $ense: Energy Monitoring and Tracking" workshop offered through Natural Resources Canada's Office of Energy Efficiency. Meters have been installed at key points in the plant, enabling the company to use monitoring and tracking software to spot energy usage anomalies and identify waste instantly, thereby enabling swift corrective action to be taken. When it comes to energy efficiency, Connors Bros. believes that no project is too big or too small to undertake. From using PLC-equivalent microprocessors to improving air-exhaust efficiency, to upgrading with power-saving high-efficiency motors, the company continues to reduce waste wherever it is found.

Crown Cork & Seal Canada, Inc.
Cans Waste Heat
with Common-Sense Solution

When faced with the challenge of removing excess heat from the air compressor at its plant in Calgary, Alberta, **Crown Cork & Seal Canada** didn't take the easy way out – it took the smart approach. Rather than install an additional cooling tower, the company invested in a heat exchanger to capture waste heat and used it to preheat water for the can-washing step in its production process.

Tackling a relatively simple problem with some imagination resulted in a simple but effective solution. Although most industries practice waste-heat utilization, applying this common-sense innovation has improved Crown Cork & Seal's washer operation. Many other companies that use water-cooled compressors or equipment could adopt the same practice and improve their bottom line.

Utilizing waste heat decreased the company's boiler requirements, thereby reducing its consumption of natural gas by 5 percent and decreasing its production of greenhouse gases. In addition to its straight gas savings, the plant has been able to reduce the chemicals used in its washer and has made minor savings in water consumption. In the future, Crown Cork & Seal hopes to use more of the waste heat from the compressor to increase washer water temperature. The company plans to implement this practice at many of its operations worldwide to achieve the same benefits.

In absolute terms, the project has reduced the plant's energy use by more than 3000 gigajoules per year. The cost of natural gas saved is slightly over $12,000 per year and, with gas prices expected to increase, the value of this project can only improve. The cost for the readily available commercial unit used for this project was $6,500. A typical cooling tower would have cost more than $25,000.

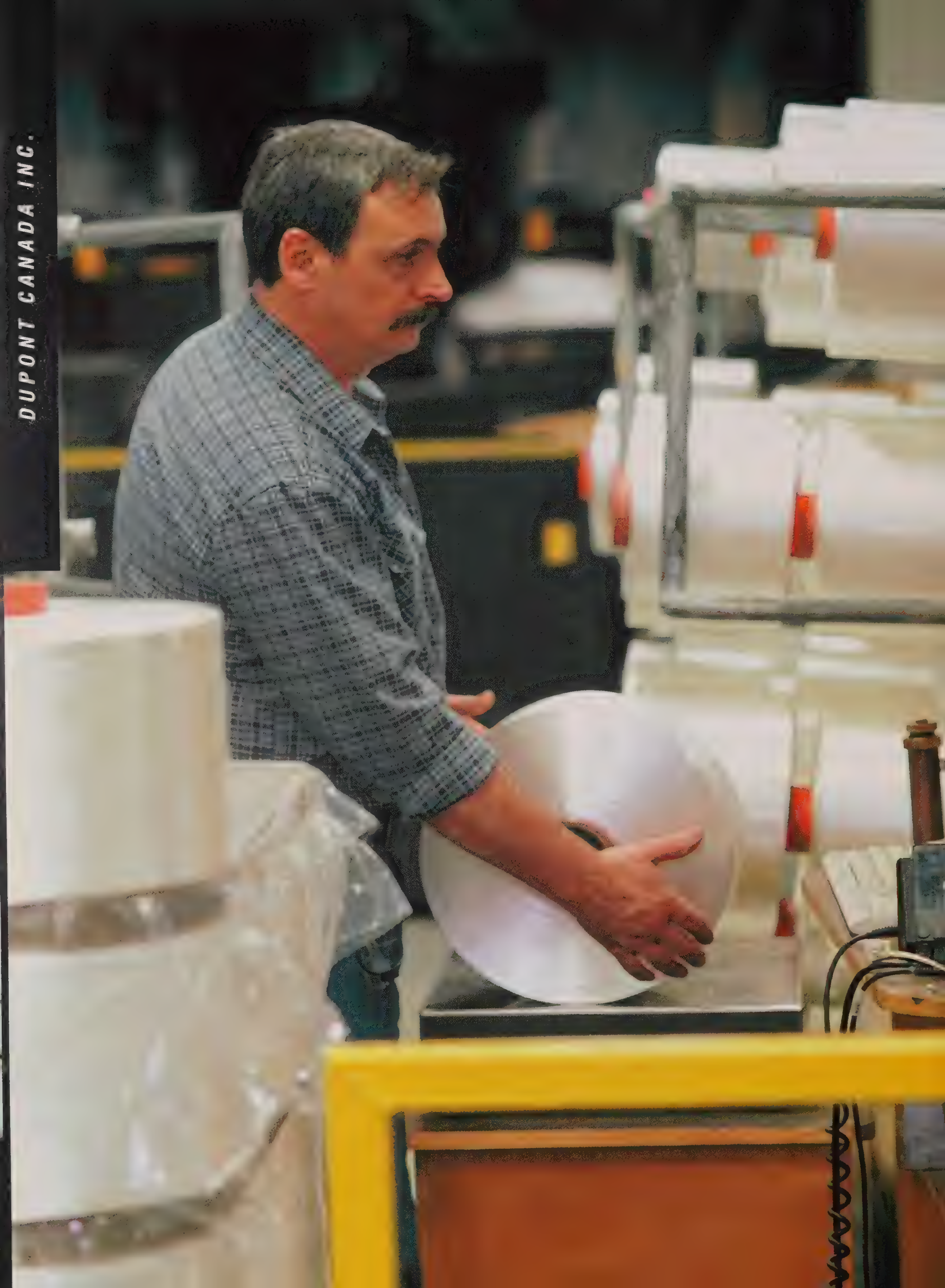
Photo courtesy of DaimlerChrysler Canada Inc.

DaimlerChrysler Canada Inc. **Picks up Speed** on Road to Energy Efficiency

DaimlerChrysler Canada has an impressive track record in energy conservation. From 1990 through 1999, by focusing on energy efficiency throughout its manufacturing operations, DaimlerChrysler Canada reduced the energy consumed per vehicle produced by 42.2 percent, from 12.36 MMBtu to 7.15 MMBtu. This improvement represents a reduction in greenhouse gas (GHG) emissions per vehicle manufactured from 0.647 to 0.373 tonne of carbon dioxide equivalent (CO_2e) over the same period.

Thanks to its ongoing emphasis on energy efficiency, DaimlerChrysler Canada anticipates a 1-percent-per-year decrease in energy intensity per vehicle produced from 1999 through 2005. This target represents a reduction in energy use per vehicle produced of 45.5 percent over the period 1990–2005, leading to decreased GHG emissions per vehicle of 0.30 tonne of CO_2e.

To maintain its energy efficiency momentum, DaimlerChrysler Canada is conducting educational activities with employees and unions. To support these and other environmental initiatives, the company is working toward certifying each of its Canadian facilities to ISO 14001 status by the end of 2001. This is a powerful message that signals DaimlerChrysler Canada's commitment to environmental stewardship and its willingness to back up that commitment with action.



DUPONT CANADA INC.

Teamwork Leads DuPont Canada Inc. to Score on Energy Reduction Goals

DuPont Canada has successfully merged energy and environmental goals with its business objectives. More than 25 years ago, the company established its Manufacturing Energy Management Team (MEMT), an interdepartmental group that focused on improving energy efficiency throughout the company's Canadian operations. Thanks largely to MEMT's leadership, DuPont Canada consistently achieves – and often exceeds – its energy goals.

For example, a new high-temperature, heat-transfer fluid vaporizer installed at the company's plant in Kingston, Ontario, has a heat efficiency that is 20 percent greater than the equipment it replaced, resulting in savings of 20.4 terajoules per year. Because of this and other energy efficiency projects, MEMT achieved its 10-year goal of a 25-percent reduction in per-unit energy consumption – six years ahead of schedule. Since 1993, the team has documented more than $20 million in cost reductions for DuPont Canada, and between the 1990 baseline year and 1999, it drove total energy consumption reductions of 28 percent.

The team's contribution to DuPont Canada's business performance has not gone unnoticed. Peter Chantraine, a tireless advocate of energy efficiency, chair of MEMT and a key member of CIPEC, was awarded DuPont Canada's highest honour, the Daedalus Award. His leadership and ability to see the big picture in the company's energy and environmental management has helped make DuPont Canada a leader in energy conservation and climate change.

FOOTHILLS CREAMERY LTD.

Foothills Creamery Ltd. **Churns Energy Savings** from Lighting Retrofit

Foothills Creamery has taken an activist approach to energy efficiency. The Alberta dairy manufacturer began serious energy-reduction efforts in 1998, when it retrofitted its Edmonton warehouse with new, high-efficiency lighting. The company replaced its existing 60-cm x 120-cm (2-ft. x 4-ft.) fixtures with T-8 lamps and reflectors that use PCB-free single electronic ballasts. Drawing only 58 watts, the new fixtures save 67 percent on the electricity used by each light. Foothills also replaced 240-cm (8-ft.) strip fixtures with a 90-cm x 120-cm (3-ft. x 4-ft.) lamp system with industrial reflectors that use 40 percent less energy and installed energy-saving motion sensors in key areas of the warehouse. The company's $20,000 investment in the retrofit has led to better lighting throughout the facility, reduced labour costs and realized significant savings in electricity usage.

Encouraged by the results, Foothills Creamery agreed to participate in the Alberta Food Processors' Association's "Leading the Way in Canada" pilot project. This project aims to reduce energy consumption and greenhouse gas (GHG) emissions at participating companies by 25 percent. Through energy audits, "Leading the Way in Canada" has identified potential annual energy savings of $6 million and related GHG-emissions reductions of 76 000 tonnes. For Foothills Creamery, energy savings from this project are another step forward on the road to better business performance.

GRAYMONT (NB) INC.

Best-Management Practices Pay off **in Energy Efficiency** at Graymont (NB) Inc.

For Graymont (NB), finding ways to reduce its energy consumption is a key corporate mission. In 1995 the New Brunswick lime producer installed a variable frequency drive on its 300-hp lime kiln exhaust fan. With the fan operating around the clock, the company's $50,000 investment has reduced electricity consumption by 8 percent and netted annual savings of 558 000 kWh. Impressed with the results, the company installed more variable drives, yielding additional savings.

Further energy savings emerged as a by-product of changes made in the crushing and screening process. These improvements increased the yield of kiln feed stone by 5 percent, reduced the quarrying period by two weeks over a seven-month period, and led to significant reductions in the use of electricity and fuel-powered mobile equipment.

In 1996 Graymont (NB) established an energy committee that was later replaced by an Environmental Management System designed on the ISO 14000 model. This system has been instrumental in identifying numerous opportunities to reduce energy consumption. Through these and other initiatives, Graymont (NB) has reduced the energy needed in the kiln process from 105.8 litres of oil per tonne of product to 99.6 litres, leading to a total annual saving of 440 000 litres of oil. These reductions are a clear indication that the company's application of cost-effective, best-management practices to advance environmental protection is delivering results.


INCO

Inco Limited Mines Savings with **Energy Breakthrough** System

Inco takes its leadership in the mining sector seriously. A mine-development and operating company with more than 10 000 employees and offices in 15 countries around the world, the company is a global leader in metal extraction and supply. Despite its size, operational diversity and international scope, the company has eagerly placed environment, health and safety among its highest corporate priorities and has annually backed its commitment by establishing aggressive energy action plans for its operations.

In 1999, to extend the scope and reach of its energy efficiency efforts, Inco introduced its Energy Breakthrough (EB) system. EB recognizes that energy management and reductions in greenhouse gas emissions require a system-wide approach with direct, defined responsibilities at each level of management. With Inco's commitment to targets that are among the most aggressive in Canadian industry, EB provides the necessary foundation for company-wide action.

Even before EB was introduced, Inco's energy efficiency efforts delivered results. The company's absolute emissions decreased from 939 kilotonnes of CO_2e in 1998 to 926 kilotonnes in 1999, despite a temporary, short-term increase in its energy and emissions indices. Moreover, Inco reduced its 1999 energy index by 9 percent relative to 1990, fully meeting the company's target of a 1-percent annual improvement. EB, with its formal structure and aggressive targets, should enable Inco to build on these improvements long into the future.

LAKE ERIE STEEL COMPANY

Lake Erie Steel Company
Blasts Energy Costs
with Innovative Project

Innovative thinking at **Lake Erie Steel Company** is yielding big energy savings. The company is using steam that is produced by waste blast-furnace gas to power air compressors in the cryogenic air-separation plant at its smelter in Nanticoke, Ontario. Lake Erie Steel located the new plant between its boiler house and cooling towers, enabling it to make better use of the steam generation and distribution system already in place, reduce connection costs and utilize its existing capacity to turn blast-furnace gas into steam. To make the process work, the company invested in a new steam turbine, auxiliary equipment and an enlarged cooling plant.

This project demonstrates that wherever a process that produces high-grade waste heat requires oxygen or nitrogen, recovered energy can be used to drive the generation of the gases. This can be applied not only in smelting, but also in steel basic-oxygen furnaces, pulp and paper mills, textiles and chemical manufacturing.

As a result of this project, Lake Erie Steel is using a no-cost, previously wasted energy source to replace purchased energy. The results are impressive. The company has reduced its energy usage by 192 terajoules per year and is saving about $1.7 million in annual operating costs. Moreover, the company has increased its blast furnace's productivity by 25 percent and has significantly reduced its NO_x and carbon dioxide emissions by 91 tonnes and 47 000 tonnes per year respectively.

Manoir Inc. Throws Cold Water on Rising Energy Costs

To become a leader in the textile industry, **Manoir**, located in Saint-Laurent, Quebec, began from scratch. In 1994 the company built a dye house to contain new equipment that produces superior-quality fabric while reducing water and energy consumption.

With the dyeing process consuming three times as much water as the bleaching process, Manoir came up with two solutions to reduce its water use – a cool-rinse process and a pulsating rinse. The cool-rinse process allows for simultaneous rinsing and cooling, which reduces cycle times and energy consumption. The pulsating rinse dilutes the dye bath gradually while the machine is operating. This process uses 20 to 30 percent less water and takes less time.

The recently installed central heat recovery and exchange system is another key component in Manoir's energy efficiency program. The main aspect of the system is that drainage from the dye machine, when passed through the coiled heat-exchange station, exits at a cooler temperature. The cooling water used in the process is thus heated and stored for later use in reservoir tanks. This system ensures a virtually constant supply of water at 52°C, compared to municipal water temperatures of close to 0°C in winter and up to 7°C in summer. This not only affords considerable savings in energy but also enables Manoir to respect effluent temperature requirements.


UNI-
RIVERSIDE
FOREST PRODUCTS LIMITED
SPF
UNDERLAYMENT
T&G FULL FACE

Riverside Forest Products Limited **Cuts Electricity** Consumption

Riverside Forest Products is serious about its commitment to significantly reduce its greenhouse gas emissions through energy conservation. An energy performance pilot project at its plywood plant in Armstrong, British Columbia, was co-funded by BC Hydro's Power Smart Services Program. This pilot study sought to assess potential energy savings opportunities in a typical wood-products manufacturing plant.

The study focused on power factor correction, veneer-drying systems and the plant's pneumatic conveying systems (fan-driven systems that move materials). It was discovered that motors in these systems were operating at low efficiency (from 27 to 50 percent), many fans were inefficient and air pressures in some systems were higher than necessary. All of these factors wasted energy and added to the plant's operating costs. A series of modifications will reduce the plant's annual electricity consumption by more than 2.1 GWh and generate annual savings of $98,200. With an investment of $326,000 needed to make the modifications, the payback period is just over three years.

The results of this energy performance contracting pilot project are significantly improving Riverside Forest Products' business performance and, through the Council of Forest Industries, encouraging other forest-products manufacturers that wish to follow this company's lead.

WEYERHAEUSER CANADA LTD.

From Pulp Fiction to True Story – **Energy Self-Sufficiency** at Weyerhaeuser Canada Ltd.

Weyerhaeuser Canada has completed a $315-million project at its pulp and paper plant in Prince Albert, Saskatchewan, with a number of environmental and economic benefits. These benefits were made possible by converting an existing recovery boiler into a wood-waste boiler, thereby reducing the company's costs for natural gas and electricity. The massive project included introducing state-of-the-art stack monitoring and control systems and a new wood-waste processing and delivery system. Thanks to the company's actions to promote energy efficiency, Weyerhaeuser was able to shut down a second recovery boiler and two gas-fired package boilers.

The impact of the project has been dramatic. The Prince Albert plant has achieved energy self-sufficiency, eliminated landfilling waste wood and dramatically reduced its greenhouse gas emissions. At the same time, the project is enabling the plant to convert its existing stockpile of wood waste into useful energy over a 10-year period, while consuming all wood waste generated at the site and by other area sawmills. The project provides maximum value from wood waste by reducing annual natural gas use by up to 70 percent and cutting purchased power requirements by up to 50 percent.










SECTOR REPORTS









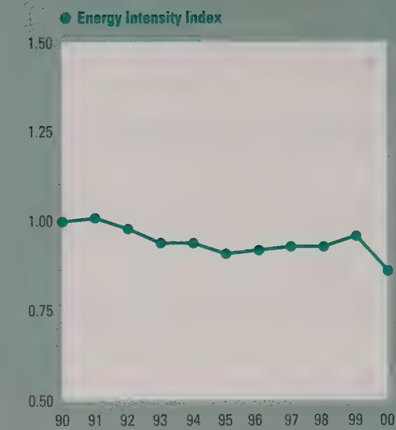

ALUMINUM

***PROFILE:** Canada's aluminum sector ranks fourth in the world in annual primary aluminum production. The combined output of the industry's 10 aluminum plants in Quebec and one in British Columbia is a major contributor to Canada's national and local economies. Although production increases have forced the industry's total energy usage slightly upward, measurements of energy efficiency continue to demonstrate much improved performance compared with the benchmark 1990 levels.*

PERFORMANCE HIGHLIGHTS

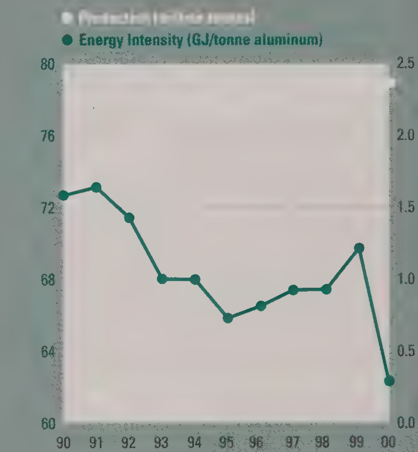
- Canada's aluminum sector is the world's fourth largest in primary aluminum production.
- Energy represents about one third of the total production cost of primary aluminum.
- The sector's energy efficiency is much improved over benchmark 1990 levels.
- Alcan Inc. announced that it plans to reduce its GHG emissions by 500 000 tonnes over the next four years.
- Alcoa inc. projects a minimum reduction in GHG emissions of 25 percent by 2010, with a 50-percent reduction possible if inert anode technology proves successful.
- Between 1995 and 2000, Aluminerie Alouette inc. reduced its specific power consumption by 7 percent while increasing metal production by 12 percent.
- Since 1990, the sector has reduced its CF_4 and C_2F_6 emissions by nearly 52 percent.

Aluminum Sector SIC 2951
Energy Intensity Index (1990–2000) Base Year 1990 (1.00)



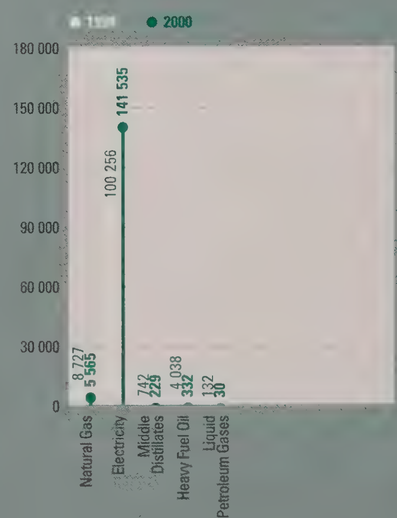
Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC), *Development of Energy Intensity Indicators for Canadian Industry: 1990–2000*, January 17, 2002, Simon Fraser University.

Aluminum Sector SIC 2951
Energy Intensity and Physical Output (1990–2000)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC), *Development of Energy Intensity Indicators for Canadian Industry: 1990–2000*, January 17, 2002, Simon Fraser University.

Aluminum Sector SIC 2951
Energy Sources in Terajoules per Year (TJ/yr.)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC), *Development of Energy Intensity Indicators for Canadian Industry: 1990–2000*, January 17, 2002, Simon Fraser University.

ACTIONS

Primary aluminum production is energy intensive, with energy representing about one third of the total cost of production. This factor alone makes efficient energy management a prime objective for all smelters. Motivated by the need to control costs in an era of rising energy prices, sector members continue to actively pursue energy efficiency improvements.

For example, on October 9, 2001, Alcan Inc. announced that it plans to reduce its GHG emissions by 500 000 tonnes over the next four years through its TARGET program. Integrated into Alcan's business strategy, TARGET uses rolling objectives to continue to raise the bar in its environmental efforts. This program is the latest in a series of environmental initiatives implemented by Alcan. Other programs include the introduction of low-polycyclic aromatic hydrocarbons (low-PAH) pitch in its older smelters, the development of process improvements that reduce anode effects, fuel switching to use natural gas in fabrication facilities, improved product design and the promotion of increased aluminum recycling. As a result of its efforts, the company achieved a real GHG-emissions reduction of more than 2 million tonnes per year in the last decade.

On April 25, 2001, Alcoa inc. announced an ambitious long-term environmental program for all of its operations that is based on sustainable development principles. From a base year of 2000, Alcoa is committed to reduce SO_2 emissions by 60 percent by 2010, cut NO_2 emissions by 30 percent by 2007, substantially trim emissions of volatile organic compounds and mercury, and reduce land-filled waste and process water use before the end of the decade. Using a 1990 base year, the company projects a minimum reduction in GHG emissions of 25 percent by 2010, with a 50-percent reduction possible if inert anode technology proves successful. Through this program, Alcoa is committed to achieving a cost reduction of US$100 million by 2005 from energy and raw materials savings, environmental management cost reductions and recycling.

Between 1995 and 2000, Aluminerie Alouette inc. reduced its specific power consumption by 7 percent while increasing metal production by 12 percent. The company now uses 12 850 kWh (dc) of power to produce 1 kg of aluminum, the best performance in the world. In addition, a thorough review of power consumption by heating and air-conditioning systems led to the installation of 207 new programmable thermostats in 2001, enabling the plant's temperature and ventilation to be adjusted based on facility use. Aluminerie Alouette's state-of-the-art air-pollution control technology provides a 99-percent gas cleaning rate for particulates and fluorides. Between 1995 and 2000, Aluminerie Alouette's total GHG emissions were reduced by 30 percent.

The aluminum industry has also been active on climate change issues. In 2001, the Aluminium Association of Canada negotiated a covenant with the ministère de l'Environnement du Québec, committing to a voluntary reduction in GHG emissions through the end of 2007.

ACHIEVEMENTS

Primary aluminum production increased by 51 percent between 1990 and 2000, while GHG emissions remained stable. Over the same period, the sector reduced its GHG emissions per unit of production by more than 36 percent of CO_2 equivalent per tonne produced. Since 1990, the aluminum sector has reduced its emissions of tetrafluoroethane (CF_4) and hexafluoroethane (C_2F_6) by approximately 52 percent.

The aluminum industry is moving decisively to replace amorphous carbon cathode blocks with more efficient graphitized blocks. Although more expensive, graphitized blocks allow plants to boost reduction pot amperage without increasing voltage, thus producing more aluminum with each kilowatt of electricity. Several Canadian smelters that operate modern pre-bake technology have already switched to graphitized blocks. This measure, combined with other process-control improvements, enables an energy utilization factor of more than 98 percent – a performance unmatched by other industries.

To further the cause of energy efficiency, the sector has established aluminum recycling as an industry-wide priority. Aluminum is fully recyclable, and turning scrap into useful metal requires only 5 percent of the energy consumed in the production of primary aluminum. Improvements in recycling rates will not only divert aluminum from the waste stream; they will also improve the sector's overall energy intensity.

CHALLENGES

Although the industry will continue to make small energy efficiency gains through enhanced processes, the most significant improvements will come from the construction of new, state-of-the-art smelters. Such a transformation requires large capital investments and the availability of large quantities of electricity at highly competitive prices. Modern facilities currently account for 72 percent of total aluminum production. However, low aluminum prices combined with high energy costs will challenge the industry's ability to generate the funds needed to finance these investments. Developing workable economic models for the continued development of new facilities remains a significant industry challenge.

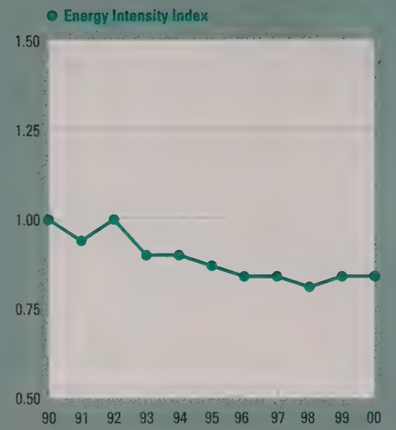
BREWERY

PROFILE: *Brewing in Canada is a diverse and modern industry that is actively pursuing ambitious energy efficiency targets. The industry is made up of two national brewing companies, several regional brewers and numerous microbreweries. Together, these establishments, which employ more than 14 000 workers in 83 breweries across Canada, produced more than 23 million hectolitres of beer in 2000.*

PERFORMANCE HIGHLIGHTS

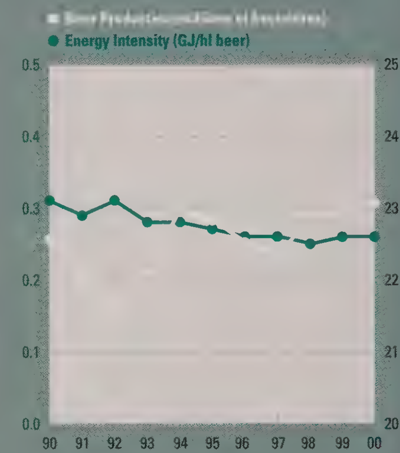
- The brewery sector employs more than 14 000 workers in 83 breweries across Canada.
- Enhanced maintenance, monitoring and control procedures are enabling brewers to identify and implement energy-saving measures.
- Compared with production in 1990, the industry has reduced its energy consumption by 17.5 percent per hectolitre of beer produced.
- The industry remains committed to an annual energy reduction of 1.0 percent over the next two years and, beginning in 2004, 1.5 percent annually through 2006.

Brewery Sector SIC 1131
Energy Intensity Index (1990–2000) Base Year 1990 (1.00)



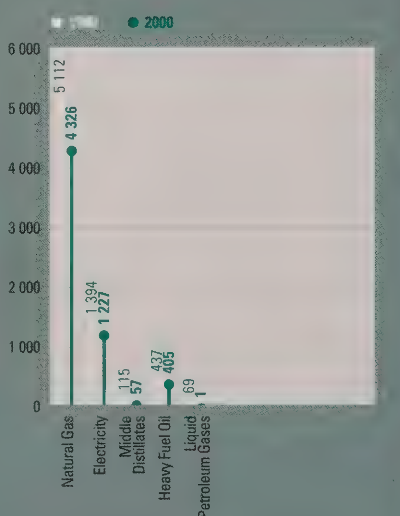
Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC), *Development of Energy Intensity Indicators for Canadian Industry: 1990–2000*, January 17, 2002, Simon Fraser University.

Brewery Sector SIC 1131
Energy Intensity and Physical Output (1990–2000)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC), *Development of Energy Intensity Indicators for Canadian Industry: 1990–2000*, January 17, 2002, Simon Fraser University.

Brewery Sector SIC 1131
Energy Sources in Terajoules per Year (TJ/yr.)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC), *Development of Energy Intensity Indicators for Canadian Industry: 1990–2000*, January 17, 2002, Simon Fraser University.

ACTIONS

Canada's brewers continued to invest in efforts to increase energy efficiency. These measures consist of significant capital investments that encompass improvements to beer process and packaging facilities. The installation of new bottle-washing and pasteurization equipment is expected to achieve energy efficiencies and reduce GHG emissions.

Enhanced maintenance, monitoring and control procedures also have enabled brewers to identify opportunities for improvement and to implement energy savings. The measures taken include improvements to heating, ventilating, lighting and air-conditioning systems; waste-trimming enhancements to post-run shutdown procedures; and continued improvements in production process systems.

Companies are working to entrench accountability for energy and utility management throughout their organizations and at the same time ensure the sustainability of implemented projects and the identification of new projects. Energy audits and energy accountability help focus employees on energy waste reduction and conservation opportunities. Meeting regularly, energy committees of managers, technical support staff and workers at the plant level have been responsible for the incremental energy improvements in all functional areas. The benchmarking of energy and water usage performance, by individual companies and among breweries internationally, has identified best practices and opportunities to reduce energy consumption and emissions in brewing operations. Some breweries undertake powerhouse audits every week.

The 1998 publication *Energy Efficiency Opportunities in the Canadian Brewing Industry* remains an excellent reference for individual energy efficiency action plans. Developed through the Brewers Association of Canada's Environment Committee with Natural Resources Canada's support, the guide highlights a vast array of energy-saving opportunities and identifies ways that energy efficiency activities can reduce costs. The guide helps to further the sector's energy-reduction performance and demonstrates the industry's commitment to the reduction of GHGs in support of the Government of Canada's environmental objectives and international undertakings.

ACHIEVEMENTS

Compared with 1990, the industry now uses 17.5 percent less energy to produce a hectolitre of beer. In 2000, the industry consumed 6018 TJ of energy, 72 percent of which was natural gas, 7 percent fuel oil and 20 percent electricity. The brewing industry is committed to an energy-reduction target of 1.0 percent per year over the next two years and, beginning in 2004, 1.5 percent annually through 2006.

CHALLENGES

Cost control is a priority for the brewing industry. Flat sales since about 1975, greater competition from foreign brewers, increased competition from products such as coolers and growth in non-taxed alternatives (such as beer produced from kits and at "u-brews") have combined to weaken sales.

Brewers have responded to these challenges by developing export strategies that make Canada one of the top beer exporters in the world. Canada's brewers have also negotiated agreements that enable them to produce a number of products in Canada that would otherwise be imported. More than 350 distinct brands are now available in the Canadian market, from traditional ales and lagers to new products that have varying strengths of alcohol, flavours and textures. Clearly, the industry is well positioned to meet its competition head-on. Product and marketing innovations notwithstanding, energy remains a substantial cost component in the brewing process. Finding ways to improve energy efficiency is, therefore, a priority for Canada's brewers.

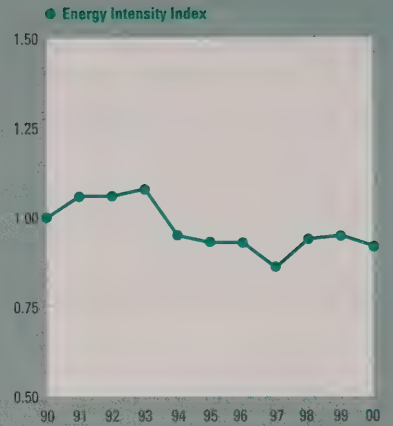
CEMENT

***PROFILE:** The cement industry is the cornerstone of Canada's domestic construction industries and a significant exporter that contributes substantially to the country's balance of payments. The industry's eight companies, which operate 16 manufacturing facilities with a combined production capacity of 14.7 million tonnes of clinker, produced 12.4 million tonnes of cement in 2000.*

PERFORMANCE HIGHLIGHTS

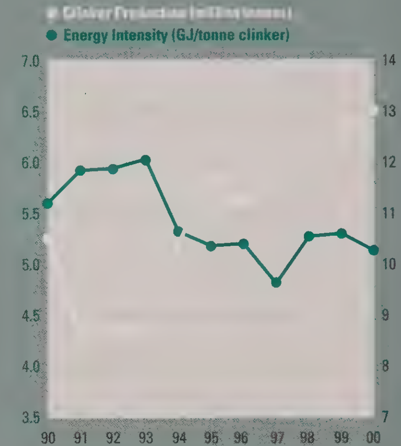
- The cement sector produced 12.4 million tonnes of cement in 2000.
- ESSROC Canada Inc. commissioned an indirect-firing and low-NO_x burner for its No. 4 kiln in April 2001.
- Ciment Québec Inc. has begun replacing engines in its limestone truck fleet in Saint-Basile, Quebec, with more efficient units.
- St. Lawrence Cement Inc. is installing a \$5.5-million granular fuel system at its facility in Joliette, Quebec.
- St. Marys Cement introduced a series of energy efficiency initiatives at its plant in Bowmanville, Ontario.
- The use of alternative fuels increased to 3197 TJ, which is between 6.3 percent and 9.0 percent of total energy used by the cement sector in 2000.
- The cement sector anticipates that kiln efficiency will improve by 2 percent through the period 2000–2010.

Cement Sector SIC 3521
Energy Intensity Index (1990–2000) Base Year 1990 (1.00)



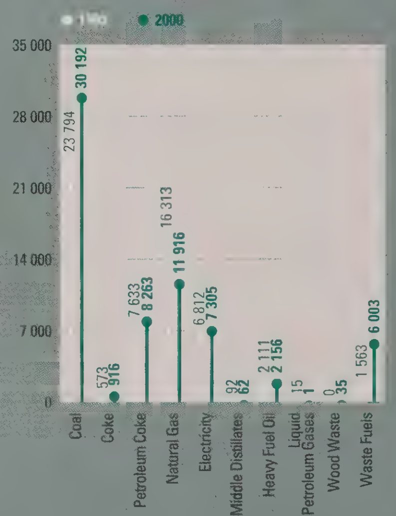
Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC), *Development of Energy Intensity Indicators for Canadian Industry: 1990–2000*, January 17, 2002, Simon Fraser University.

Cement Sector SIC 3521
Energy Intensity and Physical Output (1990–2000)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC), *Development of Energy Intensity Indicators for Canadian Industry: 1990–2000*, January 17, 2002.

Cement Sector SIC 3521
Energy Sources in Terajoules per Year (TJ/yr.)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC), *Development of Energy Intensity Indicators for Canadian Industry: 1990–2000*, January 17, 2002, Simon Fraser University.

ACTIONS

Cement manufacturers continue to take action to improve energy efficiency. For example, at its facility in Picton, Ontario, ESSROC Canada Inc. commissioned an indirect-firing and low-NO_x burner on its No. 4 kiln in April 2001. ESSROC is also implementing a plant-wide, computerized electrical-energy monitoring program and is automating its No. 1 mill. These projects will be completed in 2002 and are expected to result in reduced electrical power consumption.

Ciment Québec Inc. of Saint-Basile, Quebec, has begun replacing engines in its limestone truck fleet. The company is replacing V16 diesel atmospheric engines, which each consume 400 litres of fuel per day, with new V8 electronic injection engines with a consumption rate of 320 litres per day. Four of seven 50-tonne trucks in the fleet have already been modified, with the last three to be converted in early 2002. When the program is complete, the company will save a total of 560 litres of diesel fuel per day, representing a fuel efficiency improvement of 20 percent.

Lafarge Canada Inc. has modernized (and expanded) its plant in Richmond, British Columbia. The five-stage, single-string pre-heater and associated calciner, along with a ventless clinker cooler design and high-efficiency pulse jet main baghouse, continue to ensure environmentally sound pyro-processing in the plant. The kiln feed system is based on an airlift pneumatic conveying system that is more efficient than a screw pump design. The airlift design best meets the plant's pre-heater lifting height requirement and brings simplicity and lower maintenance costs to the system.

St. Lawrence Cement Inc. is installing a granular fuel system at its facility in Joliette, Quebec, at a cost of $5.5 million. The granular system will allow the plant to burn waste materials, such as wood chips, tire fluff, rubber chips and dried sewage sludge in granular or chip form in two of its four kilns. Once the granular fuel system is commissioned in June 2002, waste fuels will replace about 42 000 tonnes per year of coal and coke. St. Lawrence also began producing high silica fume (HSF) cement at its plant in Mississauga, Ontario. When used as a replacement for clinker (the most energy intensive component of cement), HSF significantly reduces the energy needed to produce each tonne of finished product.

St. Marys Cement introduced a series of energy efficiency initiatives at its plant in Bowmanville, Ontario. The company replaced an inlet fan damper in its coal mill with a variable-inlet vane damper, saving about $75,000 in energy costs and reducing GHG emissions by 300 tonnes per year. The plant actively reviewed power-monitoring data and identified opportunities to reduce power consumption. A new kiln burner with superior flame control was installed, creating a more fuel-efficient system, and electricity consumption was cut by lowering the grind-out timing on cement finish mills. In early 2002, the Bowmanville plant will establish an interdepartmental energy-savings team to focus on reducing the plant's electricity consumption.

To benefit the 16 cement manufacturing plants across Canada, Natural Resources Canada through the CIPEC Cement Task Force published *Energy Consumption Benchmark Guide: Cement Clinker Production.* The guide allows plants to benchmark their operations by comparing energy use with that of other plants. By focusing on the way energy is used to produce cement clinker rather than finished cement, the guide is useful to a wider variety of plants.

The Cement Sector Task Force recently established an energy committee to help sector companies share information and develop joint actions on issues such as power deregulation, energy trends, the use of waste fuel, CO_2 emissions and fuel supply and demand. The group held its organizing meeting in January 2002.

ACHIEVEMENTS

The principal energy sources used for cement production are coal, natural gas and petroleum coke. Canada's cement sector has reduced its fuel consumption by an impressive 30 percent per tonne since the 1970s, principally by implementing major process improvements. The Cement Association of Canada calculates that, at the end of 2000, direct emissions of CO_2 per tonne of concrete product showed an 8-percent decrease compared with 1990, with a further 2-percent decrease projected by 2010. Kiln efficiency improved by 11 percent between 1990 and 2000.

Since 1990, the cement sector has managed to reduce its overall energy intensity by 8.4 percent while demand for its products increased 50.6 percent. The expanded use of power monitoring, targeting and other systems and technologies will combine with plant modernizations to further energy efficiency improvements within the sector.

The cement industry continues to work closely with governments and other industries to promote "concrete" solutions to environmental issues. For example, the intelligent use of cement-based products in the transportation, residential housing and agriculture sectors can improve energy efficiency and reduce GHG emissions in these sectors, thereby supporting Canada's Kyoto goals.

CHALLENGES

Energy is a substantial cost component in the production of cement, and energy efficiency gains can improve a company's competitive position in the marketplace. This makes energy consumption a competitive issue within the cement sector, leading many companies to treat energy cost-reduction information as confidential. However, there is a growing consensus among cement producers that the benefits of sector-wide cooperation outweigh the competitive risks. As it gains momentum, this shift in attitude should lead to a broadening of information sharing and cooperation among sector companies.

Long-standing discussions among waste producers and waste users have not yet yielded an appropriate methodology to establish emissions-related credits for waste material use in the production of cement. Moreover, the potential implementation of economic instruments such as a carbon tax could seriously impair Canada's cement exports. Fortunately, at the international level, where there have been long-standing difficulties establishing mutually acceptable protocols, sector companies have agreed to use calculating standards endorsed by the World Business Council for Sustainable Development.

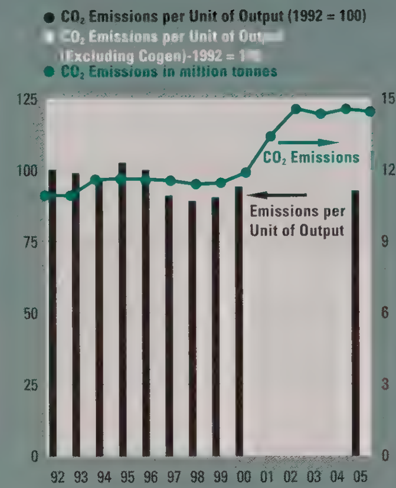
CHEMICAL

PROFILE: *The chemical sector encompasses a diverse industry that produces organic and inorganic chemicals, plastics and synthetic resins. The chemical industry is the third largest in Canada in terms of value of shipments. Companies in this sector operate 775 facilities Canada-wide, directly employing more than 24 000 people with an annual payroll of \$1.3 billion. The Canadian Chemical Producers' Association (CCPA) is the trade association that represents manufacturers in this sector. Its member companies produce more than 90 percent of industrial chemicals manufactured in Canada.*

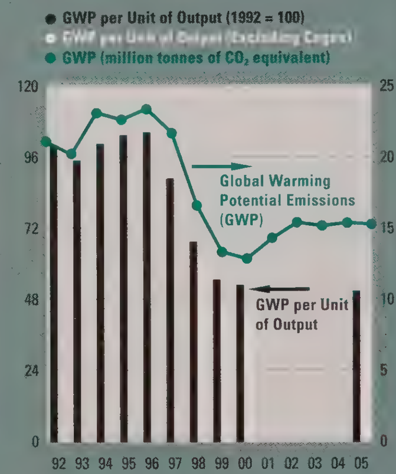
PERFORMANCE HIGHLIGHTS

- Companies in the chemical sector operate 775 facilities Canada-wide, directly employing more than 24 000 people.
- Companies that are members of the Canadian Chemical Producers' Association (CCPA) produce more than 90 percent of industrial chemicals manufactured in Canada.
- The CCPA prepared *Guidelines for Energy Efficiency and Greenhouse Gas Reporting* to assist member companies in their GHG-reduction efforts.
- In Alberta and Ontario, sector companies are using cogeneration technology to reduce CO_2 emissions produced by the utility sector.
- Ideas generated by a review of operations at Imperial Oil Limited's Products & Chemicals Division are expected to help reduce its annual energy bill by up to 20 percent.
- The sector's total GHG emissions in 2000, expressed as CO_2 equivalents, decreased 39 percent from 1992 levels.

Product Output vs. Carbon Dioxide Emissions from CCPA Member Operations



Product Output vs. Global Warming Potential of Emissions from CCPA Member Operations



Footnotes:

1. Chemical output and emission forecasts take into account announced capacity increases.
2. Historical output was calculated using constant 1992 dollars, taking into account average chemical pricing changes.

ACTIONS

The CCPA's policy statement on Responsible Care® incorporates a number of principles that provide detailed direction for reducing emissions. As they pertain to GHG emissions, these principles encourage members to:

- continuously reduce emissions with the goal of preventing unacceptable risk to the environment and human health;
- meet or exceed the letter and spirit of all legal requirements that affect operations or products;
- apply a broad range of options that include reducing, reusing, recycling and recovering and, as a last resort, end-of-pipe treatment solutions to effectively manage the environmental impact of processes; and
- assist governments and selected organizations to foster and encourage equitable and attainable standards.

In keeping with a commitment to continuous improvement, the CCPA prepared *Guidelines for Energy Efficiency and Greenhouse Gas Reporting* to assist member companies in their GHG-reduction efforts and held a workshop on emissions-estimation methods to help improve the accuracy of data.

CCPA member companies continued to pursue actions to promote energy efficiency. In Alberta and Ontario, members are using cogeneration technology to ease the demand on coal-fired power plants and reduce the CO_2 emissions per unit of energy produced by the utility sector. Most cogeneration plants use clean-burning natural gas as fuel rather than conventional oil-fired boilers and heaters, resulting in lower emissions of sulphur dioxide, carbon monoxide and particulate matter.

A good example is NOVA Chemicals Corporation's recently installed electricity/steam cogeneration power plant at the company's manufacturing facility in Joffre, Alberta. The cogeneration facility has reduced net emissions from the site from approximately 2.3 million tonnes per year to 1.2 million tonnes per year. Energy efficiency and technological improvements have led to an estimated 36-percent decrease in net CO_2 emissions and a 52-percent decrease in NO_x emissions per unit of production. The company projects that by the year 2004 its net emissions will be below 1990 levels.

Other companies have also taken major steps to improve energy efficiency. Imperial Oil Limited's Products & Chemicals Division in Sarnia, Ontario, assembled 20 international experts in 2000 to review current operations in light of leading energy-conservation practices. The review generated more than 150 opportunities to reduce steam, fuel and electricity consumption – ideas covering everything from operating changes to more sophisticated control systems. The Sarnia site expects to reduce its annual energy bill by up to 20 percent – the equivalent of heating 20 000 local area homes for a year – when its four-year improvement plan is completed.

ACHIEVEMENTS

In 2000 the chemical sector's energy consumption totalled 217 552 TJ, a 14-percent increase over 1992 levels. However, the constant dollar value of the industry's products, used as a measure of output, increased 16 percent over the same period and increased 4 percent from 1999 to 2000. From 1992 to 2000, CO_2 emissions levels increased 9 percent, and CO_2 emissions per unit of output decreased 9 percent. Total GHG emissions in 2000, expressed as CO_2 equivalents, decreased 39 percent from 1992 levels.

In 2000, emissions of methane declined by 27 percent, sharply reversing the trend of increasing methane emissions experienced prior to 1997. Similarly, emissions of nitrous oxide continued to decline with a decrease of 49 percent, for a total decrease of 91 percent since 1992. Measured in terms of global warming potential, emissions in 2000 were 4 percent lower than in 1999 and 39 percent lower than in 1992.

GHG emissions from CCPA-member companies are projected to be 28 percent lower than 1992 levels by 2005. The CCPA estimates that total CO_2 emissions per unit of output will decrease by an additional 2 percent by 2004, 8 percent less than in 1992. Including cogeneration, members expect a 32-percent increase in total emissions of CO_2 by 2005 compared with 1992. By 2005, GHG emissions expressed in terms of global warming potential per unit of output are projected to decrease by 49 percent compared with 1992, or 59 percent when excluding cogeneration emissions.

CHALLENGES

Considering the priority that Environment Canada and provincial environment ministries have placed on air quality, CCPA members have an ongoing challenge to reduce emissions while maintaining growth in their operations. In practical terms, members are guided by both technological and economic considerations in the simultaneous pursuit of improved environmental performance and enhanced global competitiveness.

Over the past decade, the energy demands of CCPA members have increased with increased levels of production. Despite the pressures of growth, member companies have been able to reduce their CO_2 emissions per unit of product. This improvement in efficiency can be partly attributed to the chemical sector's integration into an international market that demands that Canadian facilities continually invest significant capital to remain competitive with other regions.

Continued growth in the chemical industry makes it likely that, although CO_2 emissions per unit of output will continue to improve, total CO_2 emissions will grow. The dramatic changes already made through application of cogeneration and nitrous oxide abatement technologies will be difficult to replicate.

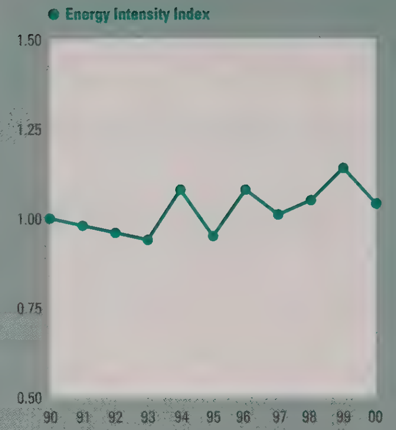
DAIRY

***PROFILE:** Canada's dairy product manufacturing sector spans Canada from coast to coast. Operating from more than 270 facilities and employing 20 500 people, Canada's dairies processed more than 73 million hectolitres of raw milk and shipped an estimated $5.9 billion worth of milk products in 2000.*

PERFORMANCE HIGHLIGHTS

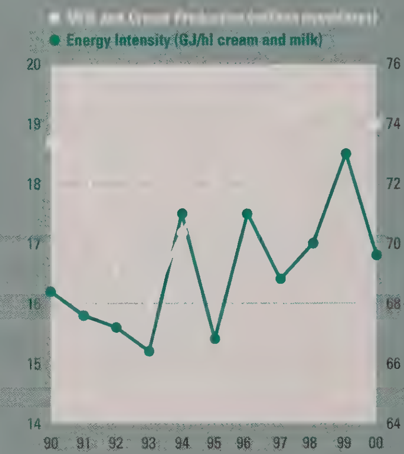
- Canada's dairies shipped products worth an estimated $5.9 billion in 2000.
- Dairies have implemented dozens of energy-saving process improvements – from thermal storage of recovered hot water to exterior tanker recycled water washes, lighting upgrades and improved control of air and water leakage.
- A systematic approach to energy efficiency enabled Kraft Canada Inc. to reduce its 2000 energy consumption per unit of production by 2.2 percent compared with 1999 – 7.1 percent below 1994 levels.
- Parmalat Dairy and Bakery Inc. made energy efficiency investments that have led to annual energy savings of $265,000.
- In 2000, the sector's total energy consumption was 12 434 TJ, up from the 1990 level of 11 952 TJ.
- The sector's energy intensity is increasing due to consumer demand for products that require more energy to produce.

Dairy Sector SIC 104
Energy Intensity Index (1990–2000) Base Year 1990 (1.00)



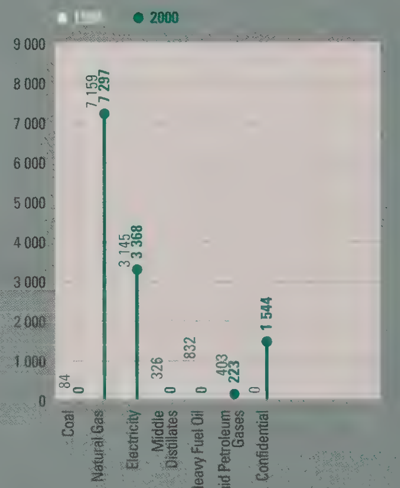
Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC), *Development of Energy Intensity Indicators for Canadian Industry: 1990–2000*, January 17, 2002, Simon Fraser University.

Dairy Sector SIC 104
Energy Intensity and Physical Output (1990–2000)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC), *Development of Energy Intensity Indicators for Canadian Industry: 1990–2000*, January 17, 2002, Simon Fraser University.

Dairy Sector SIC 104
Energy Sources in Terajoules per Year (TJ/yr.)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC), *Development of Energy Intensity Indicators for Canadian Industry: 1990–2000*, January 17, 2002, Simon Fraser University.

ACTIONS

Energy is a key component in milk processing. Typically, dairies employ electrical, thermal and water-based energy systems in their facilities for processes such as pasteurization, churning, washing, packaging, cooling, freezing and drying. Over the years, the importance of energy to the sector has led the Dairy Sector Task Force to promote industry-wide participation in efforts to improve energy efficiency.

Significant gains are coming from low-cost, no-cost and retrofit improvements throughout the industry's plant operations. Dairies have implemented dozens of such energy-saving programs – from the establishment of thermal storage of recovered hot water to the introduction of exterior tanker recycled water washes to lighting upgrades and improved control of air and water leakage.

Kraft Canada Inc. provides an excellent example of the results that can be achieved through an ongoing, systematic approach to energy efficiency and GHG reduction. In 2000, the company's total energy consumption decreased by 2.7 percent compared with 1999 and decreased 10.2 percent compared with the company's 1994 base year. Energy consumption per unit of production was 2.2 percent lower in 2000 than in 1999 and 7.1 percent below 1994 levels. Moreover, CO_2, CH_4 and N_2O emissions have declined steadily over the past five years, with 2000 CO_2 levels registering a nearly 13-percent improvement compared with 1996.

The facility of Saputo Inc.'s Milk Division in Edmonton, Alberta, involved management, production and maintenance employees in a review of its production profile requirements during 2001. The company reviewed its production schedules, processes and work force in order to find ways to eliminate waste and optimize energy use. With employees throughout the facility involved, the review led to a 7.5-percent reduction in electricity use.

Parmalat Dairy and Bakery Inc. realized significant energy savings in its plants by introducing a number of improvements. For example, the company installed an improved air-compressor system at one location, saving $20,000 per year in energy costs. Parmalat also installed boiler waste-heat recovery systems at two facilities and upgraded steam-distribution systems at three locations, leading to combined savings of $245,000 per year.

William Nielson Ltd. now recovers cooling water from its air compressors for use in its hose drops, tank line pre-rinses and truck washes at its facility in Ottawa, Ontario. The plant has also installed a closed loop cooling system for its ammonia compressors. The dairy's cooling water recovery program has reduced the company's water use and enabled it to conserve steam, thereby cutting its energy consumption.

The Dairy Sector Task Force provides companies that are seeking to make such improvements with information on expected cost savings and payback periods. In partnership with Natural Resources Canada, the task force supports the energy efficiency achievements of dairy plant managers through research and educational materials. One such report, entitled *Energy Performance Indicator Report: Fluid Milk Plants,* developed benchmarks for energy efficiency in Canadian fluid milk plants and established a methodology that is specific to the dairy industry in order to examine plant energy performance. The study also reviewed potential energy-saving ideas that are appropriate for the milk processing industry.

ACHIEVEMENTS

The dairy sector has made significant progress toward lowering its costs through improved energy efficiency. In 2000, the dairy product manufacturing sector's total energy consumption was 12 434 TJ, up slightly from the 1990 level of 11 952 TJ. The amount of milk and cream produced in 2000 was also up from 1990 levels. Except for a peak year in 1994, energy intensity remained at or below the 1990 level until 1996, when consumer demand for more energy intensive products offset the sector's progress in improving energy efficiency. Despite upward pressures, the energy consumed per hectolitre of output decreased in 2000 to 1.68 GJ from 1.85 GJ in 1999.

CHALLENGES

The promotion of energy efficiency efforts in the dairy sector suffered a temporary setback in August 2001 when the National Dairy Council of Canada, the driving force behind the sector's participation in CIPEC, was disbanded. The sector has re-established the task force, nominated a new Chair and is now in the process of rebuilding its energy task force and recruiting provincial dairy associations.

With rapidly fluctuating energy prices and limited availability of capital, developing a sound business case for investments in energy efficiency is a significant challenge for dairy product manufacturers. In addition, rationalization and competitive pressures continue to drive the industry to reduce excess capacity in the face of static sales.

Although the sector's main source of raw milk is highly regulated, the marketplace demands that dairy product companies provide innovative, high-quality, value-added products at the best possible prices. Unfortunately, creating the products consumers want often conflicts with efforts to improve energy efficiency. For example, producing the increasingly popular extended-shelf-life products requires ultra-high-temperature pasteurization and other processes that use significantly more energy per unit of output.

Manufacturers have already made the most of the low-cost and no-cost energy efficiency improvements available to them. Their greatest challenge going forward is to make the more costly, payback-delayed improvements that will further advance energy efficiency.

ELECTRICAL AND ELECTRONICS

PROFILE: *The electrical and electronics sector includes a diverse array of companies that produce electrical appliances, lighting, consumer electronics, communications and electronic equipment, cabling, office equipment, industrial equipment and other electrical products. These companies operate more than 1400 facilities and employ more than 100 000 workers across Canada. The industry is a major exporter and a vital, growing contributor to the national economy.*

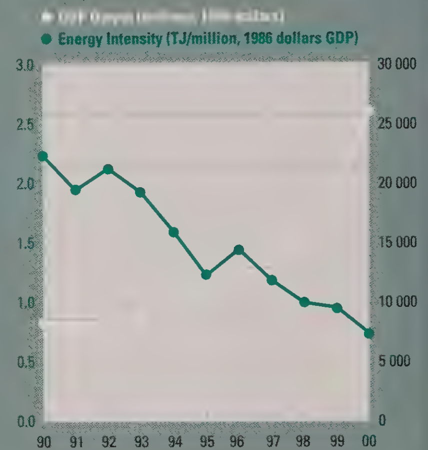
PERFORMANCE HIGHLIGHTS

- The electrical and electronics sector is Canada's least energy intensive industry.
- IBM Canada Ltd. reduced energy consumption by 29 percent between 1990 and 2000 despite an increase in business revenues.
- Nortel (Northern Telecom Limited) reduced total energy consumption in its Canadian operations by 14 percent from 1997 through 2000.
- Between 1990 and the end of 2000, the sector's energy consumption remained relatively constant despite substantial growth in production.
- The sector has decreased its energy intensity by 67.26 percent from 1990 through 2000.
- The industry anticipates a significant decrease in energy consumption over the next decade.
- Many sector products decrease CO_2 emissions by increasing the energy efficiency of other industries.

Electrical and Electronics Sector SIC 33
Energy Intensity Index (1990–2000) Base Year 1990 (1.00)

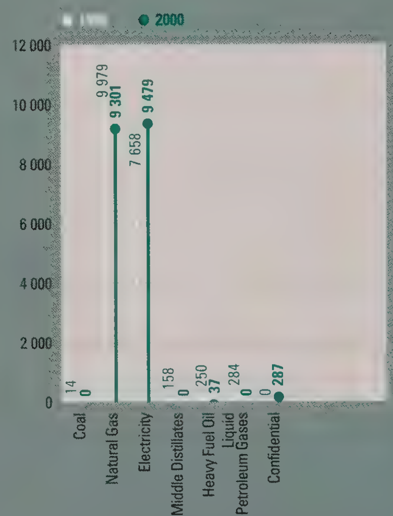
Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC), *Development of Energy Intensity Indicators for Canadian Industry: 1990–2000*, January 17, 2002, Simon Fraser University.

Electrical and Electronics Sector SIC 33
Energy Intensity and Economic Output (1990–2000)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC), *Development of Energy Intensity Indicators for Canadian Industry: 1990–2000*, January 17, 2002, Simon Fraser University.

Electrical and Electronics Sector SIC 33
Energy Sources in Terajoules per Year (TJ/yr.)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC), *Development of Energy Intensity Indicators for Canadian Industry: 1990–2000*, January 17, 2002, Simon Fraser University.

ACTIONS

Companies that operate in the electrical and electronics sector are strong proponents of environmental sustainability and energy efficiency. Although the industry is one of Canada's least energy intensive, many companies have incorporated energy efficiency programs as vital components in their efforts to control costs.

For example, by the end of 2000, energy efficiency measures taken by IBM Canada Ltd. combined to reduce the company's energy consumption from the equivalent of 591 000 MWh in 1990 to 419 947 MWh in 2000, a 29-percent reduction, despite an increase in business revenues. The year-to-year carbon dioxide equivalent (CO_2e) reductions achieved in 2000 were 10 percent, the best single-year result that the company has achieved. Energy-conservation projects implemented in 1999 and energy efficiency upgrades to computer systems contributed most to the GHG-emissions reduction. To date, IBM Canada has reduced its cumulative emissions by 26 416 tonnes since 1990. This is equivalent to an average annual reduction of 2642 tonnes per year, or a 28-percent reduction in emissions relative to 1990 levels. IBM Canada is committed to a 4-percent-per-year reduction in GHGs and projects energy savings of between 4 and 8 percent in 2001.

In an effort to improve energy efficiency throughout its organization, Nortel (Northern Telecom Limited) has implemented a program called Total Energy Asset Management (TEAM). TEAM focuses on identifying opportunities for energy savings and on developing cost-effective sources of supply for energy-efficient equipment and systems. As part of the TEAM approach, Nortel uses benchmarking, an energy management evaluation tool, auditing, reporting and a number of planning and management tools to minimize the cost of energy efficiency programs while maximizing their impact. Company-wide, Nortel has undertaken energy-reduction projects that include the installation of motion-detecting lighting systems and computerized air-conditioning and heating systems, the conversion of oil-fired boilers to natural gas, and the consolidation of operations to reduce the number of buildings occupied. In addition, the company has introduced an employee telecommuting program and a "green" commuting program at its facility in Ottawa, Ontario, that reduces automobile-produced GHGs by minimizing employee travel. As a result of these programs, Nortel reduced total energy consumption in its Canadian operations by 14 percent from 1997 through 2000, cutting its GHG emissions by a total of 3 926 000 tonnes.

ACHIEVEMENTS

Natural gas and electricity satisfy virtually all of the electrical and electronics industry's energy requirements. Between 1990 and 2000, the sector's GDP increased by 218 percent. In 2000, the industry consumed 19 104 TJ of energy, representing 0.7 percent of the energy consumed by the manufacturing sector as a whole and less than 1 percent of total energy-related manufacturing CO_2 emissions. On average, energy expenditures represent less than 1 percent of the value of the industry's shipments compared with more than 61 percent for materials and supplies and 16 percent for labour.

Between 1990 and the end of 2000, the sector's energy consumption remained relatively constant despite substantial growth in production. These factors have combined to decrease energy intensity by 67.3 percent. Consolidation of facilities resulting from acquisitions and mergers as well as internal rationalization is bringing the industry increased efficiencies of scale, which should lead to a significant decrease in energy consumption over the next decade.

The sector contributes to Canada's overall energy efficiency and GHG programs in other ways. Many sector products, from oil refinery control systems to high-efficiency motors and lighting, are used directly by companies in other sectors in order to decrease their energy consumption.

CHALLENGES

A difficult world economy and soft international markets for many sector products has led many electrical and electronics companies to put energy efficiency projects that require capital investment temporarily on hold. Energy is not a major cost component for most sector manufacturers, making energy efficiency less critical to the industry's health than technological change, market growth and sales and distribution issues. In addition, manufacturers must compete with foreign competitors that operate in countries that have fewer environmental constraints. Unilateral Canadian actions to reduce GHG emissions in response to the Kyoto Protocol can place Canadian plants at a competitive disadvantage that cannot be offset by the cost savings brought by reductions in energy use. In an industry prone to rapid and dramatic changes, most companies focus on the next two fiscal quarters, making a commitment to long-term targets difficult to justify.

ELECTRICITY GENERATION

PROFILE: *The electricity generation sector produces the electrical energy that powers industry, business and homes across Canada. Using water, fossil fuel, nuclear energy and alternative energy sources, the sector produced 58 753 GWh in 2000, meeting Canada's domestic energy needs while earning more than $1 billion in export revenues each year.*

PERFORMANCE HIGHLIGHTS

- TransAlta Utilities Corporation has established a $100-million Sustainable Development Research and Investment Fund.
- BC Hydro Corporation erected, or partnered in erecting, five wind-speed monitoring towers in 2000.
- Yukon Energy Corporation commissioned a new wind turbine to potentially displace about 350 000 litres of diesel fuel generation.
- ENMAX Energy Corporation bought a total of 1.4 million kWh of wind power for its South Service Centre.
- Ontario Power Generation Inc. plans to invest $50 million by 2005 to increase its green energy capacity.
- A partnership between Ontario Hydro Energy and Sears Canada Inc. has reduced Sears' energy costs by $22,000 monthly.
- BC Hydro Corporation replaced its 80-year-old, 52.5-MW power plant at Stave Falls, British Columbia, with a new, high-efficiency, two-unit 90-MW power plant.
- ATCO Electric's Battle River Generating Station has implemented technology that reduces particulate emissions by 27.5 percent.
- Alberta utility EPCOR made the world's largest trans-Atlantic trade of CO_2 emissions offsets.

The sector is currently working with the Office of Energy Efficiency of Natural Resources Canada to develop indices and figures.

ACTIONS

The electricity industry has demonstrated its commitment to environmental responsibility through the establishment of the Environmental Commitment and Responsibility (ECR) Program. This comprehensive program was developed and implemented by the major electrical utility companies in Canada and coordinated through the Canadian Electricity Association (CEA). Participation in the ECR Program is a requirement of CEA membership.

The main components of the program include a declaration of environmental principles and a continually improving set of environmental indicators. All participants must implement a formal environmental management system that is consistent with ISO 14001 standards in order to reduce impacts by using best environmental and business practices. The program is independently verified and is subject to a public advisory panel review.

Canada's electricity industry is rising to the challenges of energy efficiency, air quality and emissions. In the lab, Canadian utilities are pursuing ways to reduce CO_2 emissions, including fuel switching, the development of alternative generation sources, the adoption of more efficient or lower-emissions technologies and the altering of operating and maintenance procedures. In the boardroom, many utilities are delivering programs that encourage customers to use electricity more efficiently and to use it during off-peak hours. Some utilities are investing in projects that provide sinks that absorb emissions, such as increased forest cover, to offset some of the industry's own emissions until feasible solutions to reduce emissions directly can be found.

Individual electricity producers are taking significant steps toward energy efficiency and the reduction of the industry's impact on the environment. For example, TransAlta Utilities Corporation has established a $100-million Sustainable Development Research and Investment Fund for investments in renewable energy, carbon-offset projects, and the research and development of clean coal technology.

BC Hydro Corporation has set a goal of meeting 10 percent of new electricity demand with energy from "green" resources. To that end, the utility erected, or partnered in erecting, five wind-speed monitoring towers in 2000 to determine the true size of the wind resource at specific locations. BC Hydro also completed the first wind energy resources map of British Columbia, generated through computer modelling.

Yukon Energy Corporation has commissioned a new wind turbine to generate enough power for 130 homes – potentially displacing about 350 000 litres of diesel fuel generation and reducing CO_2 emissions by nearly 1000 tonnes per year. In addition, Yukon Energy's House Calls Program sends trained technicians to visit homes serviced by diesel generation to discuss energy efficiency, demonstrate products and educate households about climate change.

The Alberta utility ENMAX Energy Corporation bought a total of 1.4 million kWh of wind power for its South Service Centre. Nearly 2000 customers of wind-generated power enable ENMAX to leave an estimated 113 000 tonnes of coal in the ground.

Ontario Power Generation Inc. plans to invest $50 million by 2005 to increase green capacity from 138 MW (or 0.5 percent of generation in 2000) to 500 MW (or 2 percent of generation by 2005).

A partnership between Ontario Hydro Energy Inc. and Sears Canada Inc. has led to the replacement of the lighting system at Sears' 130 000-m^2 (1.4-million-sq.-ft.) catalogue distribution centre in Belleville, Ontario. The three-month project involved installing energy-efficient electronic ballasts in place of old magnetic ballasts in thousands of fluorescent ceiling fixtures. The partnership has reduced Sears' energy costs by $22,000 monthly.

In 2000, BC Hydro replaced its 80-year-old, 52.5-MW power plant at Stave Falls, British Columbia, with a new, high-efficiency, two-unit 90-MW power plant. The facility now provides electricity to 35 000 homes – 7000 more than it was previously able to serve.

SaskPower plans to install improved gas-fired generation technology at its Queen Elizabeth Power Station. The company will install six 25-MW gas turbines along with equipment designed to produce additional electricity from exhaust gas heat with a 30- to 45-percent increase in efficiency.

ATCO Electric's Battle River Generating Station in Forestburg, Alberta, has implemented an experimental Skewed Gas Flow Technology (SGFT) that enhances precipitator performance. The new technology reduces particulate emissions by 27.5 percent.

Alberta utility EPCOR made the world's largest trans-Atlantic trade of CO_2 emissions offsets. The deal between EPCOR and Fortum Corporation of Finland transferred 50 000 tonnes of CO_2-equivalent emissions offsets. EPCOR sees emissions trading as a useful initiative to reduce environmental impacts while balancing economic and environmental activities.

ACHIEVEMENTS

Manitoba Hydro was recognized by Canada's Climate Change Voluntary Challenge and Registry Inc. (VCR Inc.) as a Gold Level Champion Reporter, the highest level of achievement in VCR Inc.'s Champion Reporting system. Centra Gas Manitoba Hydro Inc. was recognized as a Silver Level Champion Reporter. BC Hydro's *Greenhouse Gas Report* earned VCR Inc.'s Gold Level Reporter status for the utility's management of GHG emissions during 1999. BC Hydro was also the only electric utility in 2000 to receive a Leadership Award from VCR Inc., recognizing the company for achievements in public outreach, reducing GHG emissions and overall leadership in GHG management.

CHALLENGES

The search by electrical utilities for better air quality and lower emissions is fuelled by a desire to pass on a better, cleaner world to the next generation. In early 2000, the CEA opened discussions with federal and provincial governments aimed at developing an agreement on GHG-emissions performance. CEA members put forward a proposal called the Emissions Performance Equivalent Standard (EPES). CEA's proposal would reduce net CO_2 emissions by 20 percent in 2020. However, there are difficulties in establishing a formula that is agreeable to both government and industry. Parties to the discussions have agreed to start by developing a broad framework agreement that encompasses all actions that could reduce the growth of GHG emissions from the electric power sector and provide a base for negotiation of more specific emissions limitations commitments.

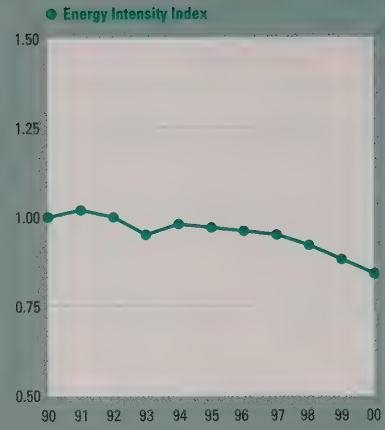
FERTILIZER

PROFILE: *Canada's fertilizer industry is one of the world's major producers and exporters of nitrogen, potash and sulphur fertilizers, manufacturing 12 percent of the world's total fertilizer materials. Companies in this sector operate more than 30 production facilities and are among the world's most energy-efficient producers.*

PERFORMANCE HIGHLIGHTS

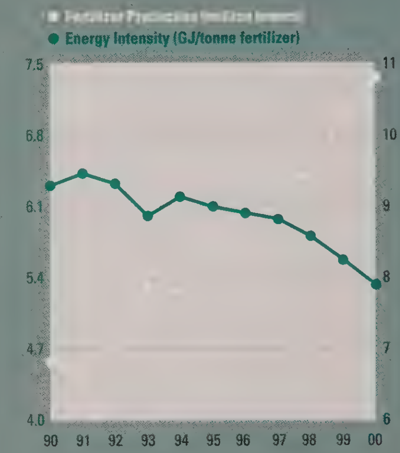
- Canada's fertilizer industry is one of the world's major producers and exporters of nitrogen, potash and sulphur fertilizers.
- The Canadian industry is among the most energy efficient compared with its global competitors.
- In 2001, the Canadian Fertilizer Institute (CFI) and Natural Resources Canada initiated a benchmarking study of the fertilizer sector.
- Potash Corporation of Saskatchewan Inc. divisions reported a number of energy efficiency improvements in 2000.
- A cogeneration project at Agrium Inc.'s Carseland Nitrogen Operations is expected to offset more than 300 000 tonnes of CO_2-equivalent GHG emissions annually.
- Fuel energy efficiency in the production of nitrogenous fertilizers has improved by about 15 percent over an 11-year period.
- The CFI concluded a comprehensive study of carbon sequestration in agricultural soils.
- Nitrogen fertilizer production increased from 6.8 million tonnes in 1990 to 10.8 million tonnes in 2000.

Fertilizer Sector – Nitrogenous SIC 3721
Energy Intensity Index (1990–2000) Base Year 1990 (1.00)



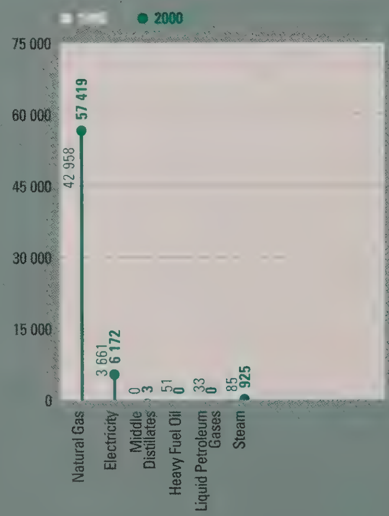
Data source: Canadian Fertilizer Institute (CFI), March 2002.

Fertilizer Sector – Nitrogenous SIC 3721
Energy Intensity and Physical Output (1990–2000)



Data source: CFI, March 2002.

Fertilizer Sector – Nitrogenous SIC 3721
Energy Sources in Terajoules per Year (TJ/yr.)



Data source:
(1) "Natural gas 1990–2000." CFI, March 2002.
(2) "Other fuels 1990–2000." Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC), *Development of Energy Intensity Indicators for Canadian Industry: 1990–2000*, January 17, 2002, Simon Fraser University.

ACTIONS

Canada's fertilizer industry has undertaken special research projects on a number of fronts. In 2001, the Canadian Fertilizer Institute (CFI) and Natural Resources Canada initiated a benchmarking study of the fertilizer sector in an effort to review currently available information and develop options for a sector energy-benchmarking protocol. Also in 2001, the CFI concluded a comprehensive study of carbon sequestration in agricultural soils under various regimes of fertilizer use and agricultural practices. A formal report will be issued early in 2002.

To find ways to increase agricultural productivity while reducing environmental impact, the CFI and its member companies have launched a three-year study of nitrous oxide emissions from fertilizer use. In another project, CFI commissioned a study to account for GHG creation and consumption throughout the life cycle of fertilizer production and use.

Individual companies were also active contributors to the sector's energy efficiency efforts, including several divisions of the Potash Corporation of Saskatchewan Inc. (PCS). PCS – New Brunswick completed a number of projects that are now paying off in improved energy efficiency, including heat recovery enhancements to its No. 1 crystallizer, thermal insulation of process equipment, and an energy-conservation information program for employees. The division has steadily reduced the total energy consumed per tonne of production from 2.05 GJ per tonne in 1993 to 1.67 GJ per tonne in 2000.

PCS – Patience Lake improved the efficiency of its recovery well pumps, eliminated mill equipment, installed heat recovery equipment on its brine system, decommissioned its fines dissolver burners and lowered operating temperatures in the compaction circuit.

PCS – Rocanville improved its energy efficiency by replacing a tails filter and cyclones with a more efficient unit, replacing four flotation cells with a column flotation unit and modifying the bit patterns on the cutting heads of its automatic miners to improve energy efficiency.

PCS – Cory installed a revised product-cycloning and centrifuging circuit to improve product recovery, replaced obsolete heating and ventilating equipment, replaced incandescent lighting with higher-efficiency metal halide light fixtures, and promoted energy efficiency among its work force through its employee newsletters.

In a joint venture cogeneration project with TransCanada Pipelines Limited completed in early 2002, Agrium Inc.'s Carseland Nitrogen Operations near Calgary, Alberta, uses gas turbines to produce about 80 MW of electrical power for export into Alberta's power grid, thereby reducing the need for coal-generated electricity. Agrium uses waste heat from the turbine exhaust to reduce natural gas consumption for steam generation. The project is expected to offset more than 300 000 tonnes of CO_2-equivalent GHG emissions annually.

ACHIEVEMENTS

According to the Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC), nitrogen fertilizer production increased from 5.4 million tonnes in 1990 to 6.8 million tonnes in 2000. However, results of the Fertilizer Sector Task Force data-quality project indicate that production of nitrogenous fertilizers increased from 6.8 million tonnes in 1990 to 10.8 million tonnes in 2000. The task force reports that the natural gas consumed as fuel in this production was 57 419 TJ in 2000 versus 42 958 TJ in 1990. This represents an improvement in fuel energy efficiency of approximately 15 percent over the 11-year period.

Based on CIEEDAC data, since 1990, potash production has increased some 35 percent, for a total of 9.41 million tonnes in 2000. Overall, energy indicators show an improvement in energy intensity that averages more than 1 percent per year since 1990.

Internationally, the Canadian fertilizer industry ranks among the lowest GHG emitters per unit of output. However, the manufacture of fertilizer requires significant natural gas and other inputs for both feedstock and energy and therefore generates emissions of GHGs, primarily CO_2. Fertilizer use also results in some GHG emissions. On the other hand, the fertilizer industry plays an important role in carbon sequestration – fixing CO_2 in agricultural soils. Carbon sequestration in "agricultural sinks" offsets to a substantial degree the environmental impact of energy consumption during the manufacturing process. Agricultural sinks could be a key component of a national short-term approach to reducing net national CO_2 emissions.

CHALLENGES

Canada's Kyoto goals have special significance to the fertilizer industry – a major energy consumer. In fact, despite the Canadian industry's international energy efficiency leadership, manufacturers could be at considerable risk if inflexible climate change policy scenarios are introduced. Current and projected energy efficiencies cannot offset the increasing demand for fertilizers that result from growing world food needs. This demand, in turn, will push total manufacturing energy consumption upward in spite of the industry's best reduction efforts.

However, the CFI believes that although gains in manufacturing energy efficiency will come in small increments, major reductions in the GHG impact of fertilizers can come from improvements in their use. The fertilizer industry supports research and other efforts that serve to improve the efficiency of fertilizer use and to foster best practices approaches within Canada's agricultural community. The industry believes that the right mix of policies, practices and economic incentives could have a substantial impact on the global effort to reduce GHG emissions. Conversely, focusing solely on the energy used by Canada's fertilizer industry could inadvertently increase global GHG emissions and exacerbate the world's food shortages.

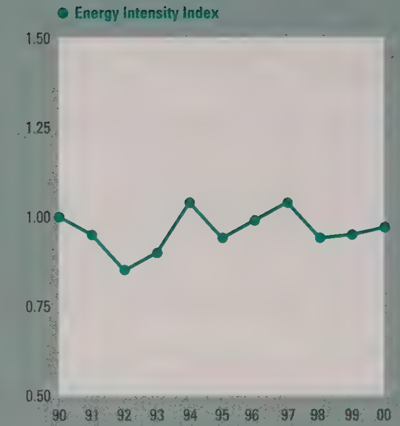
FOOD AND BEVERAGE

PROFILE: *Canada's food and beverage sector includes manufacturers that produce a diverse range of products, including meat, poultry, fish, fruit and vegetables, flour and bakery products, oils and sugars, coffee, snack foods, soft drinks and confections.*

PERFORMANCE HIGHLIGHTS

- Kraft Canada Inc. has reduced raw make-up water demand by 95 percent by reusing hot condensate from a whey evaporator as boiler feed-water make-up at its plant in Ingleside, Ontario.
- D.C. Food Processing Inc. installed a new direct-contact water heater with an energy efficiency rating of 99.7 percent, saving 19.7 percent in energy costs.
- To assist the food and beverage sector, Natural Resources Canada's Office of Energy Efficiency held two customized "Dollars to $ense" workshops for the sector in 2001.
- From 1990 to 2000, food processors improved their collective energy intensity by 3 percent.
- For the years 2000 to 2005, the sector anticipates an average reduction in energy use of 2.2 percent per year.

Food Sector SIC 10 (including Dairy SIC 104)
Energy Intensity Index (1990–2000) Base Year 1990 (1.00)

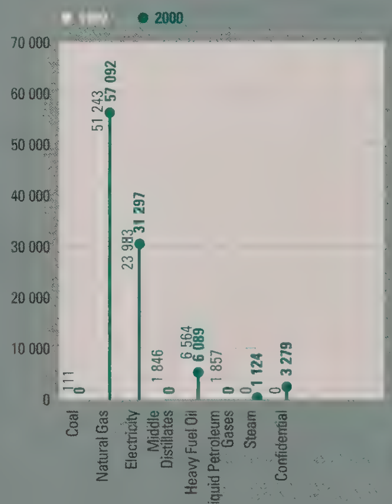


Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC), *Development of Energy Intensity Indicators for Canadian Industry: 1990–2000*, January 17, 2002, Simon Fraser University.
Note: Includes data for Dairy Sector (SIC 104).

Food Sector SIC 10 (including Dairy SIC 104)
Energy Intensity and Economic Output (1990–2000)

Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC), *Development of Energy Intensity Indicators for Canadian Industry: 1990–2000*, January 17, 2002, Simon Fraser University.
Note: Includes data for Dairy Sector (SIC 104).

Food Sector SIC 10 (including Dairy SIC 104)
Energy Sources in Terajoules per Year (TJ/yr.)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC), *Development of Energy Intensity Indicators for Canadian Industry: 1990–2000*, January 17, 2002, Simon Fraser University.
Note: Includes data for Dairy Sector (SIC 104).

ACTIONS

In 2001, the Food and Beverage Sector Task Force met three times, prior to CIPEC Task Force Council meetings. Sector meetings were hosted by the Food and Consumer Products Manufacturers of Canada, a CIPEC partner since 1999. Other partners include the Canadian Meat Council, the Baking Association of Canada, the Canadian Council of Grocery Distributors, and the sector's newest partner, the Fisheries Council of Canada, which joined in 2001. Interest in the task force's activities have also been expressed by the New Brunswick Seafood Processors Association, the PEI Seafood Processors Association and the Nova Scotia Fish Packers Association. Food sector meetings have included presentations by third parties, such as DML Control International and the Canada Centre for Mineral and Energy Technology (CANMET), providing valuable new information for CIPEC members.

Individual sector companies maintained active energy efficiency programs in 2000/2001. Following are examples.

At its plant in Ingleside, Ontario, Kraft Canada Inc. is now capturing hot condensate from a whey evaporator to use as boiler feed-water make-up. The company installed a condensate polisher and appropriate controls to feed the polished condensate to the feed-water de-aerator. The project was completed in spring 2001. This program has decreased the blowdown percentage from 3 percent to 1 percent, thus saving water and heat. Raw make-up water demand has decreased by 95 percent from an average daily consumption of 23 000 gallons to 1000 gallons, leading to annual water savings of more than 5 million gallons. By cutting natural gas use by approximately 289 000 m^3 per year and significantly reducing boiler water treatment chemicals, the waste-water recovery program is now saving Kraft more than $100,000 annually.

D.C. Food Processing Inc. installed a new direct-contact water heater to meet the sanitation needs of its plant in Waterloo, Ontario. With an energy efficiency rating of 99.7 percent, the direct-contact heater has led to net savings in energy costs of 19.7 percent. The company has also installed an air make-up system to capture previously vented air from its Cardox freezing process. The new system cuts room air exhaust from 6300 cubic feet per minute to 2800, leading to major savings in energy and equipment costs.

To assist food processors, Natural Resources Canada's Office of Energy Efficiency held two "Dollars to $ense" workshops for the sector in 2001. In Ontario, the Ministry of Agriculture, Food and Rural Affairs held sub-sector-specific workshops, which were very well received.

In 2002, the Food and Beverage Sector Task Force plans to continue its quarterly meetings, develop value-added tools for its association partners and build on past successes by holding customized regional "Dollars to $ense" workshops.

ACHIEVEMENTS

Canada's food processing industry continued to increase its gross output and GDP in 2000/2001, with GDP rising by 2.5 percent to $11.22 billion. Its total energy consumption rose to 98 884 TJ in 2000 compared with 94 113 TJ in 1999, an increase of 5 percent. Over the past 10 years, its total energy consumption increased 15.5 percent, from 85 608 TJ in 1990 to 98 884 TJ in 2000, due largely to a significant increase in electricity consumption.

Although a move toward increased automation in the sector largely explains the 10-year trend, reasons for the year-over-year increase between 1999 and 2000 are not clear. It is likely that a number of factors are involved, including statistical variations due to changes in the sample size, better-quality reports, and industrial changes such as a move toward electricity cogeneration coupled with difficulties in differentiating between power used and power sold back into the grid.

The sector's use of heavy fuel oil also increased, rising 31.3 percent over the past year. This increase is a direct result of large, rapid increases in natural gas rates in 2000 and a move back to heavy fuel oil by food processors seeking to maintain control over production costs. A roll-back in natural gas prices should drive heavy fuel oil consumption back to 1999 levels.

Fortunately, the sector has made long-term progress toward meeting its goal to improve energy efficiency. From 1990 to 2000, food processors improved their collective energy intensity by 3 percent.

CHALLENGES

Following a poll of member companies, the food and beverage sector has established aggressive targets for energy efficiency. For the years 2000 to 2005, the sector anticipates an average reduction in energy use of 2.2 percent per year. From 2006 to 2010, the sector's goal is an average reduction of 1.7 percent per year, for a total of 19.5 percent over the next 10 years.

Electricity deregulation is expected in Ontario in May 2002. This will likely result in a spike in electricity rates and drive the development of new energy efficiency initiatives. These initiatives will most likely centre on people and practices rather than the introduction of new technology.

The membership profile of the Food and Beverage Sector Task Force is diverse and is reflected in the sector's wide range of association partners. The challenge for the task force is to nurture and support each member association's participation and work toward the launch of sub-sector task groups. The sector is progressing toward this goal.

FOUNDRY

***PROFILE:** Metal castings are the first step in the value-added manufacturing chain and are utilized in the manufacture of most durable goods. Markets and industries served by foundries include the automotive sector, construction, agriculture, forestry, mining, pulp and paper, heavy industrial machinery and equipment, aircraft and aerospace, plumbing, soil pipe, municipal road castings, defence, railway, petroleum and petrochemical, electric distribution and a myriad of specialty markets. There are approximately 200 foundries in Canada, employing 15 000 people and generating annual sales of more than $2 billion. About 80 percent of the foundry sector's production is exported.*

PERFORMANCE HIGHLIGHTS

- Canada's 200 foundries employ 15 000 people and generate annual sales of more than $2 billion.
- Gamma Foundries Limited replaced two coreless induction-melting furnaces with the latest technology and installed a new energy-efficient water/air heat exchanger for winter heating.
- Crowe Foundry Limited attached a demand monitor to its furnaces to control peak demand and reduce overall energy consumption.
- Power management efforts at Lethbridge Iron Works Company Limited have reduced the company's electricity consumption by 5 percent and cut compressed-air losses in half.
- Foundry benchmarking data are now available, thanks to the creation of a tracking and reporting system based on Statistics Canada protocols.
- The foundry sector has developed an on-site energy audit program to establish cost savings and tangible environmental benefits.

The sector is currently working with the Canadian Industrial Energy End-Use Data and Analysis Centre and the Office of Energy Efficiency of Natural Resources Canada to develop indices and figures.

ACTIONS

Energy efficiency improvement is a critical activity for Canada's foundries. The industry's ongoing efforts are built on a multi-faceted strategy that begins with goal setting and includes investments in operational improvements, monitoring and targeting, energy-efficient processes and technology, and employee training and awareness programs. Throughout the sector, foundries have established energy monitoring and control systems and are reclaiming process heat for reuse in their operations.

Individual foundries continued to take action to advance their energy efficiency programs. Crowe Foundry Limited of Cambridge, Ontario, attached a demand monitor to its furnaces as part of aggressive efforts to control peak demand and reduce overall energy consumption. The company has evaluated lighting throughout its plant and introduced a program whereby lights are turned off when they are not needed. By replacing an old, inefficient water-cooled compressor with a more efficient unit, the company has also reduced its water consumption.

While replacing the firebrick lining in its heat treat furnace with new Pyrobloc efficient insulating modules, Ancast Industries Ltd. of Winnipeg, Manitoba, also improved seals, replaced the furnace's door and lowered the roof. The upgrade has reduced cycle and cool-down times, cut the time between loads, improved oven utilization and reduced natural gas consumption. Ancast also installed a new control system for office heating and plant air make-up units. The new system reuses hot exhaust air for space heating and automatically reduces energy use in non-operating hours, thereby further reducing natural gas use.

Gamma Foundries Limited of Richmond Hill, Ontario, replaced two coreless induction-melting furnaces with units incorporating the latest technology. The company also installed a new energy-efficient water/air heat exchanger to augment the plant's winter plant-heating program. By installing a new sand-reclamation system, Gamma Foundries has reduced the need for sand disposal, thereby cutting disposal costs and its use of diesel fuel. Within the plant, the company continues to improve lighting efficiency through an ongoing program to convert sodium lighting to metal halide lighting.

To combat the doubling of electricity prices due to deregulation, Lethbridge Iron Works Company Limited in Alberta has undertaken a number of power-saving initiatives. Early in the year, the company launched a program to extinguish unnecessary lighting during non-production shifts and to eliminate unneeded lights in warehouse and non-production areas. Schedules for equipment operations have been optimized, thereby minimizing the plant's daily peak electrical loads. As a result, electricity consumption has been reduced by up to 5 percent. Lethbridge Iron Works also introduced an aggressive program to eliminate leaks in its compressed-air system, enabling the foundry to reduce total leakage by more than half. A small, 40-horsepower compressor was installed for use during low-demand non-production hours, saving about 260 000 kWh annually – enough electricity to power 33 homes for a year.

At the sector level, the Canadian Foundry Association (CFA) continues to pursue activities in keeping with its energy efficiency plan. In partnership with Natural Resources Canada's (NRCan's) Office of Energy Efficiency (OEE), the CFA has created an energy efficiency opportunities guidebook and cooperated in the development of "Dollars to $ense" workshops specifically for the foundry sector. Foundry benchmarking data will be available in next year's annual report thanks to the establishment of an appropriate tracking and reporting system for energy and production data based on protocols established by Statistics Canada. The CFA and the OEE are exploring the gathering of energy-benchmarking information in conjunction with the CFA's "Pilot Project on Productivity Improvement," beginning early in 2002.

The foundry sector has also piloted the development of an on-site energy audit program, which combines elements of NRCan's former Mobile Foundry Audit program and the OEE's current Industrial Energy Innovators audit program. The audit process will enable companies to identify and implement improvement projects in energy, water, waste-water, GHG and air emissions, and solid wastes to realize cost savings and tangible environmental benefits.

ACHIEVEMENTS

Motivated by environmental and bottom-line concerns, Canada's foundries continue to implement energy efficiency improvements and reduce GHG emissions. Many companies no longer use GHG-generating fuels such as coal, oil or coke in their operations and have eliminated the use of steam produced by coal-generated electricity.

Escalating oil, natural gas and power costs are leading a growing number of companies to adopt active programs throughout the industry, including the adoption of more efficient equipment, better methods, fuel switching and waste-energy capture programs. These actions are bolstering the sector's efforts to improve its energy efficiency.

CHALLENGES

Driven by the rising cost of energy, Canada's foundries are on an endless search for energy-efficient equipment and methods. To remain competitive, foundries must closely monitor energy consumption and implement programs to improve energy efficiency. These efforts are complicated by the sector's growing business complexity. Many sector companies now go far beyond raw castings to design parts, build tooling, cast prototypes and make, machine and assemble the casting. Often, they are called on to produce completed components or assemblies, ready for the customer's assembly line. Although these additional activities have added to the sector's capabilities, employment and profit, they have also led to increased energy consumption.

The often conflicting needs to respond to customer demand for expanded services, remain price competitive and meet environmental standards are taxing the resources of many foundries and creating a need for new, cost-effective energy efficiency technologies and solutions.

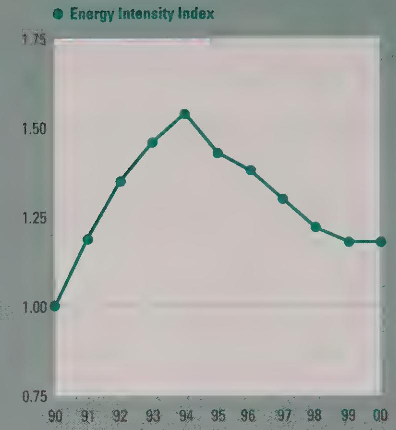
GENERAL MANUFACTURING

***PROFILE:** The general manufacturing sector comprises a variety of industries, including leather, clothing, furniture, printing, machinery, construction materials, floor coverings, imaging products, insulation, adhesives and pharmaceuticals. The sector encompasses approximately 2000 small-, medium- and large-sized companies that, combined, consumed 180 422 TJ of energy, or about 7 percent of the total energy consumed by all CIPEC sectors in 2000.*

PERFORMANCE HIGHLIGHTS

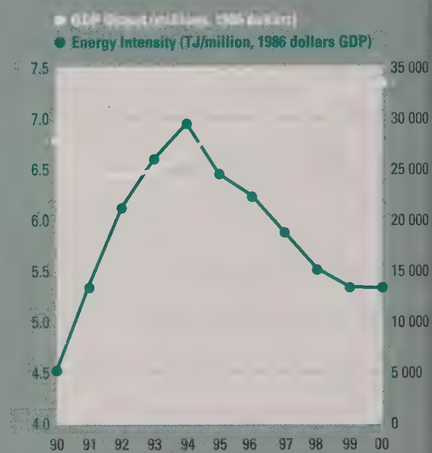
- The approximately 2000 companies included in the general manufacturing sector consumed about 180 422 TJ of energy in 2000.
- Task forces in Alberta and Quebec have broadened CIPEC's reach in western and eastern regions.
- Versacold Corporation is capturing waste heat from its compressors and evaporators and using it to preheat steam process water for Maple Leaf Potatoes.
- Improvements to motor drive, lighting and production process systems have netted International Paper Industries Ltd. a 10-percent improvement in annual energy consumption.
- Owens Corning has announced its "2002 Energy Mission," a worldwide corporate energy strategy that aims to reduce the company's energy consumption by 20 percent by 2003.
- A boiler plant upgrade at Coyle & Greer Awards Canada Ltd. has reduced boiler energy costs by 29 percent.
- Teknion Furniture Systems Inc. has implemented an energy-conservation program as part of its ISO 14001 program.
- Sintra Inc. has made improvements to its stone-crushing unit that have reduced energy consumption per tonne of stone processed.
- Soprema Inc. conducts an active, ongoing environmental awareness program for employees.
- EMCO Limited installed high-efficiency boilers at its plant in La Salle, Quebec, improving the efficiency of its steam plant by 13 percent.

General Manufacturing Sector
Energy Intensity Index (1990–2000) Base Year 1990 (1.00)



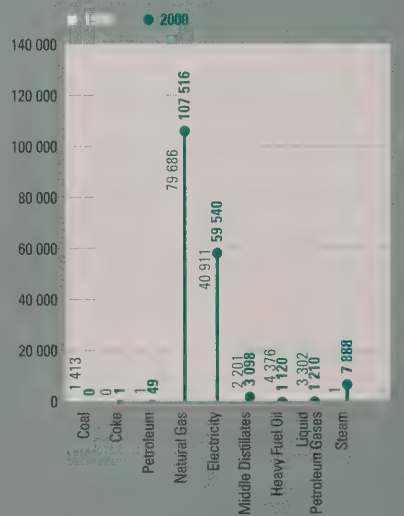
Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC), *Development of Energy Intensity Indicators for Canadian Industry: 1990–2000*, January 17, 2002, Simon Fraser University.

General Manufacturing Sector
Energy Intensity and Economic Output (1990–2000)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC), *Development of Energy Intensity Indicators for Canadian Industry: 1990–2000*, January 17, 2002, Simon Fraser University.

General Manufacturing Sector
Energy Sources in Terajoules per Year (TJ/yr.)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC), *Development of Energy Intensity Indicators for Canadian Industry: 1990–2000*, January 17, 2002, Simon Fraser University.

ACTIONS

The General Manufacturing task forces continue to aggressively pursue energy efficiency improvements across the country. In Ontario, the Central Task Force is strengthening its membership with increased participation of industry representatives and associations. In Quebec, the Eastern Task Force has attracted an active membership that includes associations reaching nearly all corners of the province.

The Western Task Force continues to address issues arising from deregulation and fluctuating power costs. Based in Alberta, the group has been working to broaden participation within Alberta and expand its reach into the other western provinces.

Across the country, individual general manufacturing sector members are making important contributions to energy efficiency. For example, at its facility in Lethbridge, Alberta, cold food storage and distribution company Versacold Corporation is capturing waste heat from its compressors and evaporators and using it to preheat steam process water for Maple Leaf Potatoes. The two companies share the same facility. In its first year of operation, the $105,000 project reduced natural gas consumption by 11 percent, saved 13 000 GJ of natural gas and led to reduced electricity consumption. When all energy savings are combined, the payback period for the project is less than one year.

International Paper Industries Ltd. of Surrey, British Columbia, has made improvements to its motor drive, lighting and production process systems, which has netted the company a 10-percent improvement in annual energy consumption. The company expects further gains to come from preventive maintenance programs on its rolling stock, efficiency upgrades to its electrical systems and capital investments in alternate drive systems.

Owens Corning has announced its "2002 Energy Mission," a worldwide corporate energy strategy that aims to reduce the company's energy consumption by 20 percent by 2003. Energy makes up about 15 percent of the company's total cost of operations. Already an active participant in energy efficiency efforts, Owens Corning has recently converted the lift trucks at its facility in Edmonton, Alberta, from propane to natural gas, thereby saving $20,000 per year in energy costs.

Coyle & Greer Awards Canada Ltd. of Mossley, Ontario, has upgraded the boiler plant at its Mossley facility, thereby reducing boiler energy costs by 29 percent. Teknion Furniture Systems Inc. of Toronto, Ontario, has implemented an energy-conservation program as part of its ISO 14001 program for 2002. The company already uses motion sensors to control lighting and automatic thermostats that vary heating based on hours of operation. Teknion is now looking at ways to improve the efficiency of its drying and curing ovens.

The paving company Sintra Inc., headquartered in Montréal, Quebec, has made improvements to its stone-crushing unit that have reduced energy consumption per tonne of stone processed. The company also emphasizes energy efficiency in the selection of engine-powered mobile equipment.

Bituminous membrane manufacturer Soprema Inc. of Drummondville, Quebec, is an ISO 14000 registered company committed to sound environmental practices. The company conducts an active, ongoing environmental awareness program for employees and has recently made improvements to its cooling tower to reduce energy consumption.

EMCO Limited has converted the main dryer on the production line of its plant in Pont-Rouge, Quebec, from steam coil heat to a more efficient direct-fire natural gas system. The company has also installed two new high-efficiency boilers at its plant in La Salle, Quebec, improving the efficiency of its steam plant by 13 percent and reducing CO_2 emissions.

ACHIEVEMENTS

The General Manufacturing task forces continue to make progress in meeting the commitments outlined in their 1999/2000 action plan. The task forces have established and are maintaining ongoing collaborative efforts with manufacturing, technology and energy organizations with an interest in furthering industrial energy conservation and efficiency. Moreover, growing regional task forces in western and eastern Canada are extending CIPEC's reach to manufacturers nationwide. Across the country, the sector continues to pursue and encourage the involvement of other associations and firms and to stimulate the reporting of energy efficiency progress by the sector's Industrial Energy Innovators.

These efforts are paying off as sector companies continue to earn recognition for their efforts toward improved energy efficiency. The latest of these companies is EMCO Limited, an Industrial Energy Innovator, which has been recognized as a Silver Level Champion Reporter by Canada's Climate Change Voluntary Challenge and Registry Inc. (VCR Inc.). The award is the second highest level of achievement in VCR Inc.'s Champion Reporting system.

CHALLENGES

The implementation of energy efficiency programs is an uphill battle for many companies in the general manufacturing sector. For less energy intensive companies, the relatively small role that energy plays in overall costs makes it difficult to justify major capital expenditures. Where energy is a larger component of overall costs, many manufacturers, especially smaller ones, lack the knowledge and financial resources to identify and act on energy-saving opportunities. For companies of all sizes, the lack of staff and capital resources to dedicate to energy projects is a significant impediment.

These challenges are exacerbated by wide fluctuations in energy prices, which make it difficult to build a classical business case for investments in energy efficiency. Moreover, as many companies restructure to lower costs and reduce staffing, the competition for resources has pushed energy efficiency improvement programs to the back burner.

Compounding difficulties is the sector's diversity. Covering an extremely broad range of industries comprising companies of all sizes makes it a challenge to develop comprehensive, accurate, sector-wide energy data.

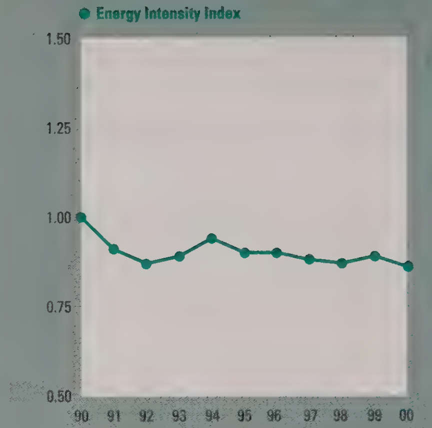
LIME

***PROFILE:** Canada's merchant lime sector supplies essential raw materials for steel production, mining, pulp and paper manufacturing, water treatment, environmental management and other basic industries. Operating 15 facilities and employing more than 700 people, the sector's four companies and their affiliates had a combined lime calcining capacity of 3.13 million tonnes in 2000. Although lime production in 2000 dropped by 0.6 percent compared with 1999, production increased by a total of 28.1 percent compared with 1990.*

PERFORMANCE HIGHLIGHTS

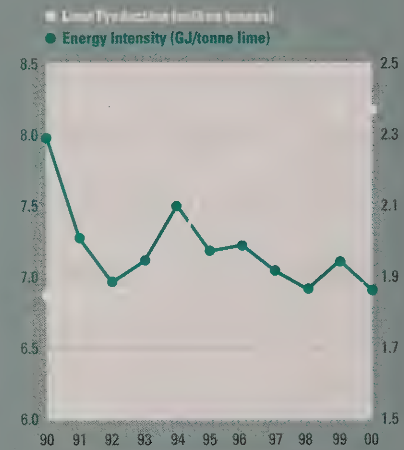
- From 1990 to 2000, the lime sector increased production by 28.1 percent.
- Graymont (NB) Inc. cut the fuel used in its kilns by 440 000 litres per year.
- Graymont Western Canada Inc. plans to improve its energy monitoring and tracking system.
- Beachville Lime Limited introduced a new operating strategy that has led to a reduction in coal, coke and natural gas consumption of 1 528 956 million Btu in 2000 and an additional 592 451 million Btu in 2001.
- While total energy consumption increased by 1604 TJ between 1990 and 2000, the sector's energy intensity index decreased by 13.5 percent.
- Companies representing 98.7 percent of the lime production capacity in Canada's merchant lime sector are now Industrial Energy Innovators.

Lime Sector SIC 3581
Energy Intensity Index (1990–2000) Base Year 1990 (1.00)



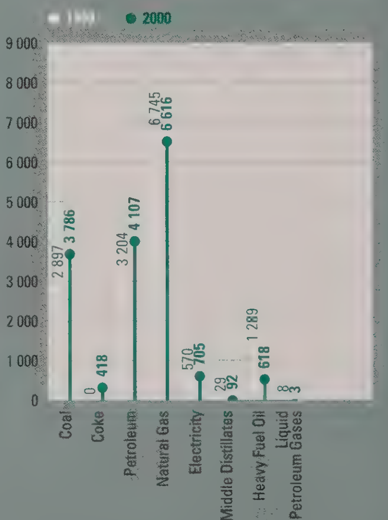
Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC), *Development of Energy Intensity Indicators for Canadian Industry: 1990–2000*, January 17, 2002. Simon Fraser University.

Lime Sector SIC 3581
Energy Intensity and Physical Output (1990–2000)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC), *Development of Energy Intensity Indicators for Canadian Industry: 1990–2000*, January 17, 2002. Simon Fraser University.

Lime Sector SIC 3581
Energy Sources in Terajoules per Year (TJ/yr.)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC), *Development of Energy Intensity Indicators for Canadian Industry: 1990–2000*, January 17, 2002. Simon Fraser University.

ACTIONS

In 2001, the Canadian Lime Institute in conjunction with Natural Resources Canada's Office of Energy Efficiency produced *Energy Efficiency Opportunity Guide in the Lime Industry.* The guide looks at all aspects of lime production and identifies projects and operational measures that can be employed to improve energy efficiency.

Individual companies in the lime sector continue to make significant energy efficiency improvements. For example, through a variety of energy efficiency measures, including the introduction of an environmental management system built on an ISO 14000 model, Graymont (NB) Inc. has reduced the energy needed in its kiln from 105.8 litres of oil per tonne of product to 99.6 litres. This action is saving the company 440 000 litres of oil annually. Other initiatives launched by the company have led to significant reductions in the use of electricity and fuel-powered mobile equipment.

In 2000/2001, Beachville Lime Limited introduced an operating strategy that improves the balance between regional kiln operation efficiencies and client quantity and quality demands. This strategy has enabled the company to rationalize kiln operations, eliminate energy-inefficient kilns and allocate increased loads to more efficient kilns. These actions led to a reduction in coal, coke and natural gas consumption of 1 528 956 million Btu in 2000 and a further 592 451 million Btu in 2001.

Chemical Lime Company of Canada Inc. has set an energy efficiency improvement target of 1 percent per year. The company has installed variable frequency drives and has made improvements to process furnaces, dryers, kilns, compressed-air systems, water systems, motor drives and other systems. Chemical Lime expects to boost kiln efficiency even further by improving its stone-sizing system and will use exhaust CO_2 to treat storm-water run-off.

Graymont Western Canada Inc. has made improvements to its dryers, kilns, motors and lighting systems in its progress toward greater energy efficiency. The company anticipates that annual upgrades to capital equipment along with improvements to its energy monitoring and tracking system will lead to further energy efficiency gains.

ACHIEVEMENTS

Within the merchant lime sector, Industrial Energy Innovators account for 98.7 percent of Canada's production capacity, and companies represented by the Canadian Lime Institute continue to work actively to improve the energy efficiency of their operations.

In 2000, it took 16 350 TJ of energy to produce 2 367 714 tonnes of lime. This compares with 16 935 TJ and 2 381 395 tonnes in 1999, and 14 746 TJ and 1 847 906 tonnes in 1990. Energy consumption per tonne of lime decreased from 7.11 GJ per tonne in 1999 to 6.90 GJ in 2000, a 3-percent improvement. While total energy consumption increased by 1604 TJ between 1990 and 2000, the sector's energy intensity index decreased by 13.5 percent. The sector continues to target continuing improvement at a rate of 0.3 percent to 0.5 percent per year.

About 60 percent of the GHGs emitted by the lime sector result from the calcination or decomposition of limestone. The remaining 40 percent is related to the energy used to prepare limestone for calcination and to convert it into finished products. GHG emissions resulting from the production of lime are offset to some extent by the re-absorption of CO_2 by lime during its life cycle. The National Lime Association estimates that more than 25 percent of the lime produced in Canada and the United States re-absorbs CO_2 either in process or naturally.

CHALLENGES

The production of lime occurs at high temperatures using large quantities of combustion fuel. Natural gas is the principal fuel source, with petroleum, coke and coal making up most of the balance. In an industry heavily dependent on such fuels, rapidly rising fuel prices make energy efficiency a top priority. However, although ongoing refinements continue to be made to existing calcining equipment, substantial capital investments in new, more efficient kiln installations are needed in order to make major gains. Lime producers continue to be challenged to find the capital necessary for such investments.

Producers are also challenged to balance energy efficiency with quality. Fuel switching and high-efficiency large kiln technology may reduce energy requirements, but they can also interfere with product quality, a significant concern for some of the sector's largest customers.

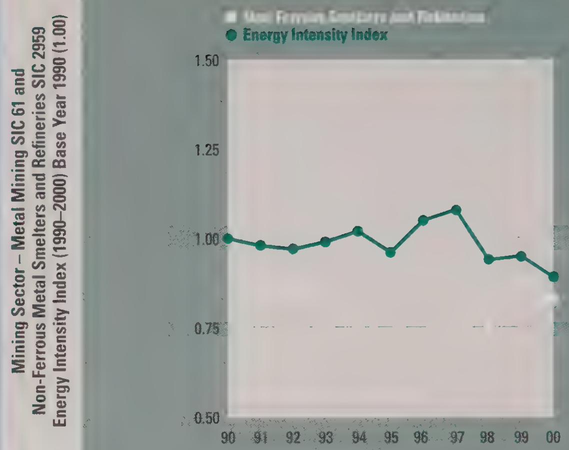
MINING

PROFILE: *Canada's minerals and metals industry produces 60 different mineral commodities. In January 2001, there were 71 metal mines and 26 non-ferrous metal smelters and refineries (excluding aluminum) located across Canada. The mining and minerals processing industry directly employs 401 000 people and contributed $28 billion to Canada's GDP in 2000 – 3.6 percent of the national total.*

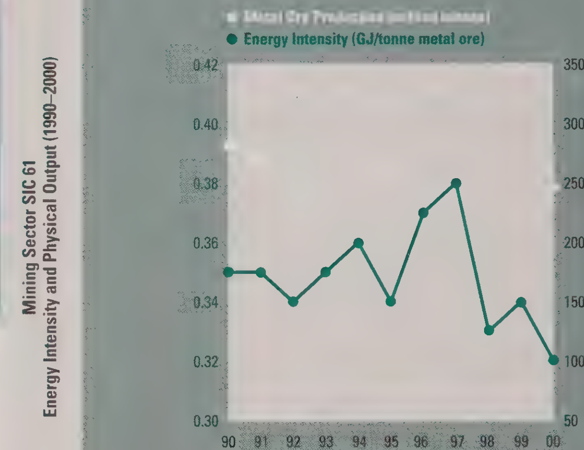
Canada is one of the world's largest mineral exporters, with 77 percent of its production – valued at $49 billion – destined for foreign markets. This represents 13 percent of total domestic exports, or one in every eight export dollars. Despite an overall decline in mineral prices in recent years, mineral and metal exports increased by 70 percent between 1993 and 2000.

PERFORMANCE HIGHLIGHTS

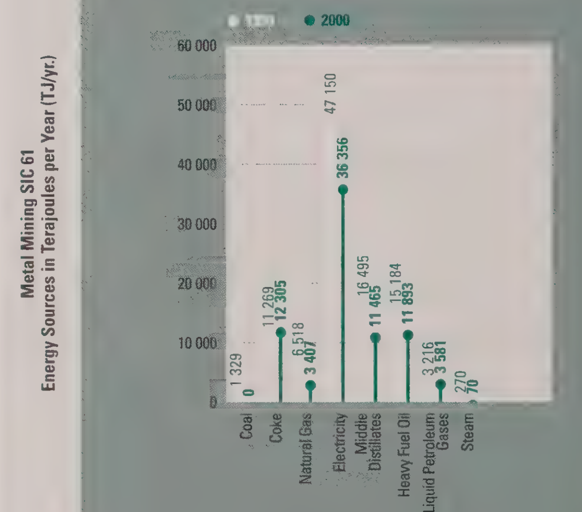
- Canada is one of the world's largest mineral exporters, with 77 percent of its production – valued at $49 billion – destined for foreign markets.
- To date, Canada's Climate Change Voluntary Challenge and Registry Inc. (VCR Inc.) has awarded Gold Level Champion Reporter status to five companies that are members of the Mining Association of Canada (MAC).
- To enable companies to take basic inventory of GHGs, estimate emissions changes for specific projects and report on emissions, MAC has released its *Strategic Planning and Action on Climate Change – A Guide for Canadian Mining Companies* on CD-ROM.
- MAC's Task Force on Energy hosted its first annual energy efficiency conference in April 2001.
- Nine MAC members are currently completing an open-pit energy-benchmarking study.
- At its Raglan facility in the Nunavik territory of northern Quebec, Falconbridge Limited is employing an innovative heat recovery system to convert waste heat from its diesel generating system into usable energy.
- A pilot energy breakthrough program at Inco Limited has generated more than 450 energy-saving ideas from the company's plant personnel.



Data source for SIC 2959: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC), *An Action Plan for Reducing Greenhouse Gas Emissions*, Mining Association of Canada, October 2001.



Data source for SIC 61: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC), *Development of Energy Intensity Indicators for Canadian Industry: 1990–2000*, January 17, 2002, Simon Fraser University.



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC), *Development of Energy Intensity Indicators for Canadian Industry: 1990–2000*, January 17, 2002, Simon Fraser University.

ACTIONS

Members of the Mining Association of Canada (MAC) are firmly committed to participating in a solution to climate change and have made energy efficiency a priority. As part of their commitment to GHG reduction, 16 of MAC's 30 members, representing the majority of energy consumed in the mining sector, participate in Canada's Climate Change Voluntary Challenge and Registry Inc. (VCR Inc.). To date, VCR Inc. has awarded Gold Level Champion Reporter status to five MAC member companies (Falconbridge Limited, Inco Limited, Noranda Inc., Suncor Energy Inc. – Oil Sands, and Syncrude Canada Ltd.); Silver Level Champion Reporter status to Koch Canada, L.P.; Newmont Canada Limited; and Teck Cominco Limited; and Bronze Level Champion Reporter status to BHP Billiton Diamonds Inc. In 2001, MAC became one of three associations awarded VCR Inc.'s Gold Level Champion Reporter status.

MAC has issued *Strategic Planning and Action on Climate Change – A Guide for Canadian Mining Companies*. This guide, prepared with assistance from the Pembina Institute, Stratos and Natural Resources Canada's Office of Energy Efficiency, is a pivotal tool to help the mining industry devise climate change strategies that support long-term GHG-reduction efforts.

In June 2001, the guide was released on CD-ROM. This format, with its electronic template for inventorying, measuring and reporting on climate change actions, will enable companies to take basic inventory of GHGs, estimate emissions changes for specific projects and report on emissions.

To help the industry align its strategic and corporate actions on climate change, MAC's Task Force on Energy hosted its first annual energy efficiency conference in April 2001. At the conference, energy managers from across Canada identified eight requirements for an effective energy efficiency program, including management commitment, measurement and control, communications, alternative energy development, new technology, operational optimization and government policy.

MAC's Task Force on Energy is committed to fostering new concepts in energy efficiency. For example, in addition to the completion of an underground bulk mining energy-benchmarking study, nine MAC members are currently completing an open-pit energy-benchmarking study. Within the industry, individual companies are seizing opportunities to improve energy efficiency.

For example, at its remote Raglan facility in northern Quebec, Falconbridge Limited is employing an innovative heat recovery system to convert waste heat from its diesel generating system into usable energy. This technology bypasses the need to generate an additional 250 GW of electricity and enables Raglan to cut its annual emissions of CO_2 equivalent by 70 kilotonnes. Thanks to its heat recovery program, Raglan's power and heating system energy conversion efficiency is 65 percent, and its overall cost per kWh is $0.06, making the Falconbridge facility one of the world's most energy-efficient sub-arctic mining facilities.

Inco Limited has a long-standing commitment to energy efficiency and GHG-emissions reduction. Now, a pilot energy breakthrough program has uncovered additional opportunities for energy efficiency. By setting aggressive targets, developing effective metrics and focusing on end-user behaviour, the pilot project has generated more than 450 energy-saving ideas from the company's plant personnel. In the first three months, natural gas consumption fell 25 percent below budget, and electricity use dropped 10 percent below budget. So far, the pilot project has generated sustainable annual energy efficiency gains of $3.5 million.

ACHIEVEMENTS

The metal mining industry's energy mix is heavily weighted toward electricity (46 percent), followed by heavy fuel oil (15 percent) and middle distillates (14.5 percent). In 2000, total energy used in metal mining was 79 080 TJ. Over the period 1990–2000, energy consumption in metal mining decreased by 22 percent, while energy intensity, or energy per unit of metal concentrate, improved by 9 percent.

The non-ferrous metal smelting and refining industry (excluding aluminum and magnesium) also has an energy mix weighted toward electricity (49.4 percent), followed by natural gas (26.1 percent) and coal (12.6 percent). In 2000, total energy use was 86 225 TJ. While the non-ferrous sector increased its energy consumption by 5 percent over the period 1990–2000, energy intensity – or energy per unit of refinery output – plus matte export improved by 11.9 percent (1990–1999).

CHALLENGES

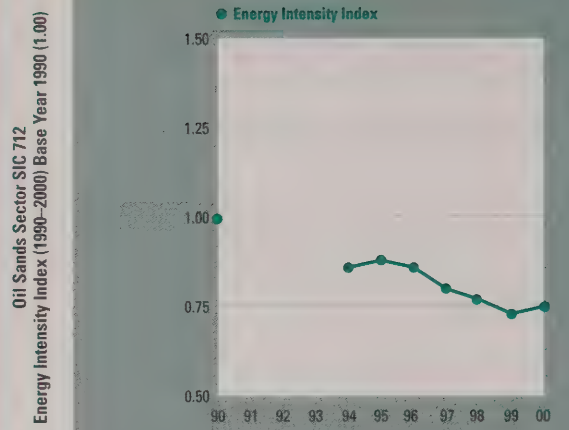
Energy costs for Canada's mining sector represent a significant component of the total costs of operations, making energy efficiency an industry priority. To meet this challenge, the industry has employed new technology and results-based energy audits to boost its energy efficiency, reduce emissions and improve competitiveness. Fortunately, many financially attractive opportunities still exist for improving energy efficiency and reducing costs. However, the limits of technology and the net cost of further reducing GHG emissions are significant barriers.

OIL SANDS

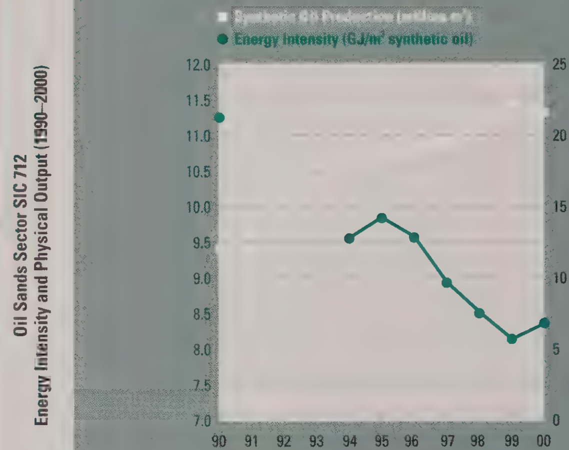
PROFILE: *Canada's oil sands sector includes two plants in northern Alberta and one heavy oil upgrader in Saskatchewan. Together, these facilities produce more than 500 000 barrels of crude oil per day for markets in Canada and the United States. The sector is a major employer and a significant contributor to Canada's GDP.*

PERFORMANCE *HIGHLIGHTS*

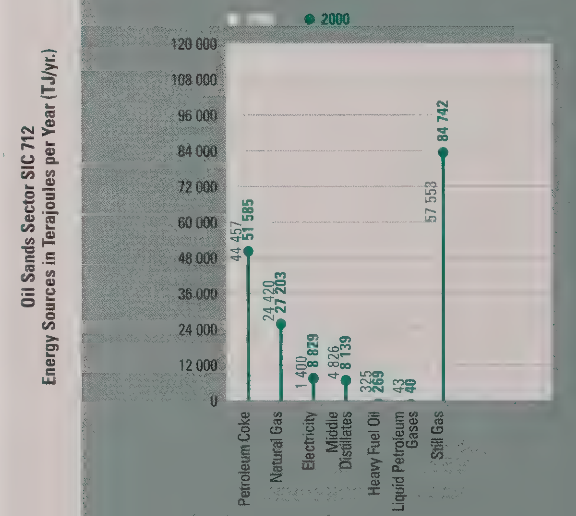
- The oil sands sector is committed to ongoing improvements in energy efficiency through a combination of operational excellence and technological innovation.
- Husky Energy Inc.'s cogeneration project at its site in Lloydminster, Saskatchewan, is reducing GHG emissions by 168 000 tonnes per year on a CO_2-equivalent basis.
- Suncor Energy Inc.'s oil sands 2000 CO_2-equivalent emissions per unit of production were 30.7 percent below the benchmark 1990 level.
- From 1988 to the end of 2000, Syncrude Canada Ltd. cut CO_2 emissions per barrel of oil produced by 27 percent.
- The upcoming Athabasca Oil Sands Project is committed to a best-practices approach to environmental management.
- In 2000, energy consumed per unit of production was 8.36 GJ/m³, a total improvement of 25 percent since 1990.



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC), *Development of Energy Intensity Indicators for Canadian Industry: 1990–2000*, January 17, 2002, Simon Fraser University.



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC), *Development of Energy Intensity Indicators for Canadian Industry: 1990–2000*, January 17, 2002, Simon Fraser University.



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC), *Development of Energy Intensity Indicators for Canadian Industry: 1990–2000*, January 17, 2002, Simon Fraser University.

ACTIONS

The oil sands sector continues to make ongoing improvements in energy efficiency through a combination of operational excellence and technological innovation. Plants are improving the reliability of their operations and introducing programs to recover waste heat and boost yields through more efficient processing. Other gains are coming from the introduction of new technologies in the mining and extraction stages.

Husky Energy Inc. is now drawing power from the Meridian Cogeneration Project at its heavy oil upgrader site in Lloydminster, Saskatchewan. The project is a joint effort with TransAlta Energy Corporation, the cogeneration plant's operator. Steam transferred from the plant has enabled Husky to reduce the heat in some of its boilers, leading to an estimated emissions-reduction equivalent of 168 000 tonnes of CO_2 per year. A further 14 000-tonne reduction in CO_2 equivalent was achieved when Husky optimized process controls on its upgrader power boilers.

Suncor Energy Inc. – Oil Sands has been engaged in the construction of a four-year, $3.4-billion expansion called Project Millennium that will see oil sands production nearly double to 225 000 barrels of oil per day by the end of 2001. Suncor is also exploring new technologies that could significantly reduce emissions from oil sands production. Following evaluation, the company will pursue technologies that show major environmental and economic potential for the next stage of development. Technologies being evaluated include warm- and cold-water extraction, thickening and clarifying of tailings streams, coke gasification, solvent recovery and CO_2 sequestration disposal methods. Suncor's oil sands 2000 CO_2-equivalent emissions per unit of production were 30.7 percent below the benchmark 1990 level, and the company projects that efficiency initiatives now underway will lead to a further drop to 0.574 tonnes of CO_2 equivalent per unit of production by 2005.

"Syncrude 21," Syncrude Canada Ltd.'s 11-year strategic capital investment program begun in 1997, is upgrading oil sands operations and improving energy efficiency. The first stage of this four-stage program, which covers the company's new North Mine and several de-bottleneck projects in its upgrader, has been completed, and the new facilities are in operation. The second stage, which includes the first train of the company's Aurora Project and further de-bottlenecking of bitumen processing units, was put into operation in the second quarter of 2000. Syncrude 21 and predecessor activities have had a significant impact on the company's energy efficiency and, subsequently, on GHG emissions. From 1988 to the end of 2000, Syncrude cut CO_2 emissions per barrel of oil produced by 27 percent. The company estimates that by 2010 the total reduction will improve to 40 percent.

Syncrude employees have also pledged to take individual action to improve energy efficiency. More than 600 employees have agreed to reduce their GHG emissions by an average of 2860 kg per year under the Energy Council of Canada's Action By Canadians on Climate Change (ABC) Program. These pledges represent a 14-percent decrease in average household GHG emissions, which is substantially higher than the program's 2000-kg minimum requirement.

The Athabasca Oil Sands Project, scheduled to begin operations in late 2002, is committed to a "best practices" approach to environmental management. The project plans to build on the experience of existing oil sands operators and implement new technologies to increase environmental performance in all of its new facilities. Energy efficiency is a priority for the project, and the Athabasca consortium plans to use gas-fired cogeneration at both of its facilities.

ACHIEVEMENTS

In 2000, the oil sands sector continued to make steady progress toward energy efficiency, but due to an unusual number of operational upsets, the energy intensity was slightly higher than the previous year. Energy consumed per unit of production was 8.36 GJ/m^3, which is 3 percent higher than in 1999. While total annual production rose 81 percent since 1990, energy use rose only 36 percent. In 2000, energy consumption totalled 180 809 TJ. Energy intensity showed a total improvement of 25 percent since 1990. This compares favourably with the sector's target of a 1-percent minimum average improvement in energy efficiency per unit of production.

Oil sands industry members continue to emphasize energy efficiency and are constantly pursuing ways to minimize the impact of their operations on the environment. Their commitment is reflected in their efforts to reduce the use of coke by switching to natural gas, resulting in a significant reduction in GHG emissions.

CHALLENGES

The oil sands sector's challenges are mainly technological and financial. Companies operating in this sector must continue to combine investment in innovative technologies with operational excellence to reduce the energy consumed in production. Better, less energy intensive extraction methods must be developed and implemented, and material-handling systems must be modified to more efficiently accommodate increasing production loads. These activities are both time-consuming and expensive. The long lead times and substantial investments required to introduce enhancements continue to force difficult choices on the industry and limit the sector's progress toward greater energy efficiency.

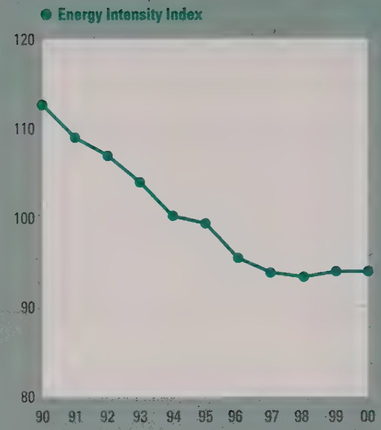
PETROLEUM PRODUCTS

PROFILE: *Canada's petroleum products sector markets gasoline, diesel, heating oil, jet fuels, lubricating oil, grease, food-grade white oils, asphalts and aromatic hydrocarbons through a network of more than 15 000 wholesale and retail outlets nationwide. Operating 21 oil refineries across the country, the industry provides direct employment for 100 000 Canadians and generates an estimated 100 000 indirect jobs.*

PERFORMANCE HIGHLIGHTS

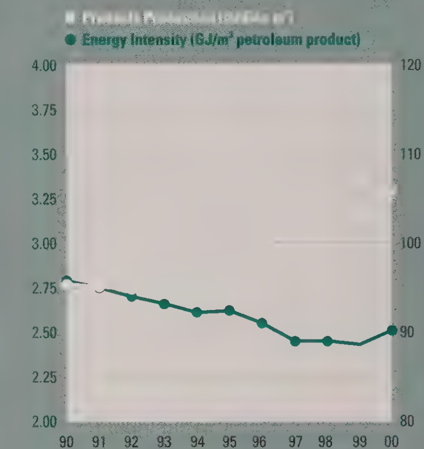
- The industry operates 21 oil refineries across the country and provides 100 000 direct jobs.
- Ultramar Ltd. recorded its best CO_2 emissions intensity results in 10 years – an improvement of 12 percent compared with 1990.
- Petro-Canada implemented projects in 2000 that cut more than 45 000 tonnes from the company's annual GHG emissions and saved more than 800 000 GJ of energy.
- Imperial Oil Limited launched its Global Energy Management System with an end-to-end assessment of energy usage at the company's refinery in Strathcona, Alberta.
- Shell Canada Products Limited's refinery in Scotford, Alberta, focused on reducing the load on hydrocracker process heaters in 2000.
- Suncor Energy Inc. plans to invest $100 million in alternative and renewable energy over the period 2000–2005.
- In 2000, the sector's energy intensity index stood at 94.0, 16.6 percent better than in 1990.

Petroleum Products Sector SIC 3611
Solomon Energy Intensity Index (1990–2000)
Base Year 1990 (112.7)



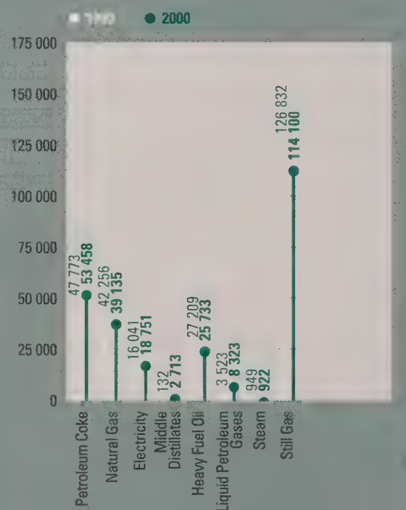
Data source: *Review of Energy Consumption in Canadian Oil Refineries and Upgraders: 1990 to 2000.* Prepared for the Canadian Petroleum Products Institute (CPPI) and the Canadian Industry Program for Energy Conservation (CIPEC) by John Nyboer. Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC), November 2001, Simon Fraser University.

Petroleum Products Sector SIC 3611
Energy Intensity and Physical Output (1990–2000)



Data source: *Review of Energy Consumption in Canadian Oil Refineries and Upgraders: 1990 to 2000.* Prepared for the Canadian Petroleum Products Institute (CPPI) and the Canadian Industry Program for Energy Conservation (CIPEC) by John Nyboer. Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC), November 2001, Simon Fraser University.

Petroleum Products Sector SIC 3611
Energy Sources in Terajoules per Year (TJ/yr.)



Data source: *Review of Energy Consumption in Canadian Oil Refineries and Upgraders: 1990 to 2000.* Prepared for the Canadian Petroleum Products Institute (CPPI) and the Canadian Industry Program for Energy Conservation (CIPEC) by John Nyboer. Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC), November 2001, Simon Fraser University.

ACTIONS

Member refineries of the Canadian Petroleum Products Institute are committed to improve the refining sector's energy intensity index by 1 percent per year through to 2005. To meet this goal, individual Canadian refiners continue to invest in capital projects and make improvements to their operations that are enhancing energy efficiency.

For example, at its refinery in Saint-Romuald, Quebec, in 2000, Ultramar Ltd. replaced defective steam traps, reduced flare losses, improved crude preheat train performance, modified a steam generator and distillate air-cooled exchanger, insulated steam-heated bunker tanks, steam pipes and steam stations, and made capital investments designed to improve energy efficiency. As a result of these activities and its ongoing focus on energy efficiency, Ultramar recorded its best CO_2 emissions intensity results in 10 years – an improvement of 12 percent in 2000 compared with 1990.

Along with its parent and sister companies, Imperial Oil Limited launched its Global Energy Management System (GEMS) with an end-to-end assessment of energy usage at the company's refinery in Strathcona, Alberta. Refinery staff spent some six months compiling data on energy usage in every function, process and operation in the plant. A team of about 20, including experts from within the ExxonMobil refining, research and engineering networks along with outside consultants, then spent two months on-site assessing energy efficiency performance and preparing recommendations for improvement based on global best practices. The GEMS assessment resulted in a comprehensive list of energy-saving ideas along with implementation recommendations, cost estimates and resource requirements. The company will undertake a similar assessment at its refinery in Nanticoke, Ontario, in 2002.

Petro-Canada implemented projects in 2000 that cut more than 45 000 tonnes from the company's annual GHG emissions and saved more than 800 000 GJ of energy. The company estimates that emissions reductions and energy efficiency projects proposed for implementation between 2001 and 2004 will result in additional annual reductions of 1 999 282 GJ of energy and 106 284 tonnes of CO_2 equivalent. Since 1990, the company's actions have reduced annual GHG emissions by more than 1.3 million tonnes.

In 2001, in conjunction with Enbridge Pipelines Inc., Suncor Energy Inc. began construction of the SunBridge Wind Power Project in Gull Lake, Saskatchewan. This $20-million project is expected to generate 11 MW of electricity from 17 wind turbines for distribution through the Saskatchewan power grid. Suncor plans to invest $100 million in alternative and renewable energy over the period 2000–2005. Potential projects include research, development and investment in the production of fuels from biomass, the conversion of municipal solid waste to energy through recovery of methane from landfills, and opportunities in solar and wind power. In 2000, Suncor's GHG-emissions intensity (emissions per unit of production) was 16 percent lower than 1990 levels.

Shell Canada Products Limited's refinery in Scotford, Alberta, focused on reducing the load on hydrocracker process heaters in 2000. Staff examined ways to change the temperature profile of the hydrocracker reactors to reduce the energy required to reheat the process. The refinery introduced a modified temperature profile that reduced the load on the hydrocracker heaters by 15 percent during a trial period. Over the year, this energy reduction could result in savings in excess of $1 million and have a positive impact on GHG emissions. Shell continues to evaluate the optimum application of this technique.

ACHIEVEMENTS

Production of petroleum products and energy intensity increased in 2000. Compared with 1999, production rose by 2.7 percent, while energy intensity increased by 3.5 percent to 2.51 GJ/m^3.

Energy consumption increased by 16 154 TJ, or 6.5 percent, in 2000 compared with the previous year. Since the 1990 base year, the sector's total energy consumption has decreased by 0.04 percent to 266 177 TJ. In 2000, the sector's energy intensity index stood at 94.0, the same as in 1999 and 16.6 percent better than in 1990.

CHALLENGES

Economic uncertainty, fluctuating crude costs and unpredictable international events are making ongoing energy efficiency improvements more challenging for the petroleum products sector. Since higher-capacity utilization improves refinery efficiency, thereby lowering the energy required per unit of output, refiners will be challenged to maintain production at optimum levels in a period of unpredictable demand. In 2000, capacity utilization was 92.0 percent, compared with 90.2 percent in 1999.

The industry will be required to reduce sulphur levels in gasoline and diesel fuels. Meeting increasingly stringent content standards requires refineries to employ more energy intensive methods and processes, which makes it more difficult and expensive to reduce CO_2 emissions. New energy efficiency concepts will be needed for the industry to maintain its trend of continuous improvement.

PULP AND PAPER

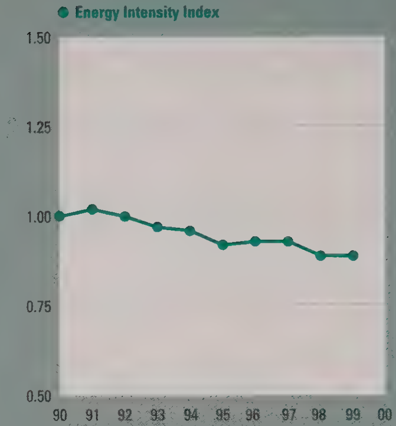
***PROFILE:** Pulp and paper, a key component of the forest products industry, is a major contributor to Canada's economy. Besides pulp, the sector includes the newsprint, paperboard, building board and other paper sub-sectors.*

PERFORMANCE HIGHLIGHTS

- Howe Sound Pulp and Paper Limited Partnership has reduced its overall GHG emissions by 12.7 percent since 1990.
- Stora Enso North America, Port Hawkesbury Mill, plans actions that will reduce energy use by 10 percent by 2005.
- Nexfor Inc. has reduced its CO_2-equivalent emissions by 30 percent since 1990.
- Weldwood of Canada Limited has reduced its direct GHG emissions per tonne of output by 30.4 percent since 1990.
- Canfor Corporation expects that projects underway or planned will reduce its 2005 emissions by 10 to 15 percent compared with 1990.
- Alberta-Pacific Forest Industries Inc.'s carbon sink poplar plantations will sequester 561 029 tonnes of CO_2 per year by 2024.

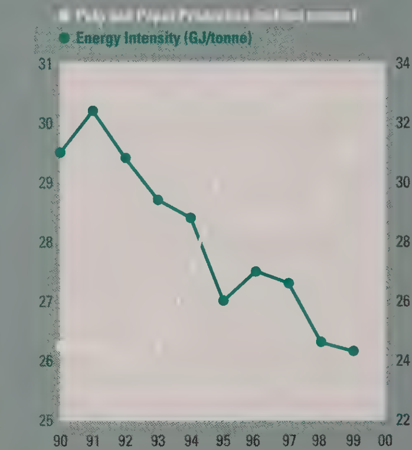
Pulp and Paper Sector SIC 271
Energy Intensity Index (1990–1999) Base Year 1990 (1.00)

Note: Data for the pulp and paper sector for 2000 were not available at time of printing.



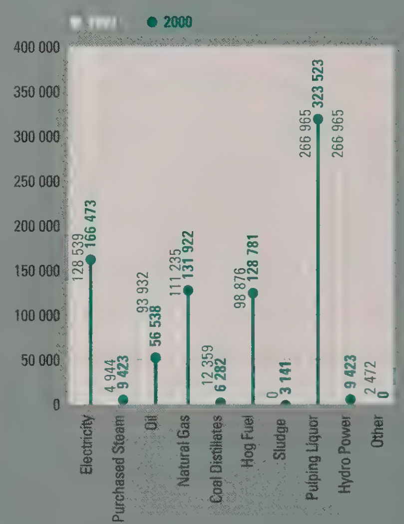
Data source: Forest Products Association of Canada (formerly the Canadian Pulp and Paper Association), *Energy Monitoring Report*, December 12, 2000.

Pulp and Paper Sector SIC 271
Energy Intensity and Physical Output (1990–1999)



Data source: Forest Products Association of Canada (formerly the Canadian Pulp and Paper Association), *Energy Monitoring Report*, December 12, 2000.

Pulp and Paper Sector SIC 271
Energy Sources in Terajoules per Year (TJ/yr.)



Data source: Forest Products Association of Canada (formerly the Canadian Pulp and Paper Association), *Energy Monitoring Report*, December 12, 2000.

ACTIONS

Pulp and paper companies continue to improve energy intensity and implement programs to reduce the use of fossil fuels. Following are some examples.

Since 1990, Howe Sound Pulp and Paper Limited Partnership of British Columbia has taken a number of measures to mitigate GHG emissions, including the substitution of natural gas for Bunker C oil, the substitution of wood residues for natural gas, and a variety of process improvements to improve heat and electrical energy efficiency. While these measures have been somewhat offset by production increases, the company has still managed to reduce its overall GHG emissions by 12.7 percent in 2000 relative to the 1990 baseline.

Thanks to the recent availability of natural gas, Stora Enso North America, Port Hawkesbury Mill, of Nova Scotia expects to reduce its CO_2 emissions by 32 percent per tonne of output compared with 1990 levels. The company has also taken measures to cut electricity consumption and plans actions that will combine to reduce energy use by 10 percent by 2005.

Nexfor Inc. has reduced its CO_2-equivalent emissions by 30 percent since 1990 through a combination of energy efficiency projects and the replacement of fossil fuels with biomass energy sources.

Weldwood of Canada Limited has reduced its total GHG emissions by 4.1 percent since 1990, with further reductions forecast for 2001. Although total product output from all company operations, including new acquisitions, has increased 39.0 percent since 1990, overall direct GHG emissions per tonne of output declined by 30.4 percent by the end of 2000.

The substitution of sawmill wood residue biomass energy for fossil fuels, the introduction of electricity cogeneration and other actions taken by Canfor Corporation have reduced the company's GHG emissions by 4.3 percent between 1990 and 2000. The company estimates that projects underway or planned will reduce its emissions in 2005 by 10 to 15 percent compared with 1990.

Alberta-Pacific Forest Industries Inc. is undertaking projects that will significantly impact its GHG emissions. The company plans to sell approximately 6 MW of power annually to the Power Pool of Alberta, indirectly reducing GHG emissions by 46 384 tonnes of CO_2 equivalent per year in the Alberta grid by replacing fossil-fuel-generated power. In addition, Alberta-Pacific Forest Industries has begun creating a forest carbon sink by planting hybrid poplars on agricultural land near its mill. By 2024 the poplar plantations will cover more than 23 600 hectares and sequester 561 029 tonnes of CO_2 per year.

Spruce Falls Inc., a Tembec Inc. company, reports that although its overall energy consumption has risen since 1990 due largely to increased production, the energy used per unit of output has decreased significantly. The company estimates that energy consumed per tonne of product in 2001 was nearly 11 percent below 1990 levels, with a further 4.8-percent decrease expected by 2005. GHG emissions for the same period declined an impressive 62 percent.

The Forest Engineering Research Institute of Canada (FERIC) has adapted Natural Resources Canada's FleetSmart program to create a driver training package that meets the specific needs of the forestry trucking industry. The program, called SmartDriver for Forestry Trucks, was developed in consultation with truckers and the forest industry and is designed to reduce fuel consumption through driver education. The program is available on an interactive, self-directed CD-ROM or as a classroom program delivered by trainers.

FERIC is also working with Tembec Inc. in a partnership called "star trucks." This program integrates the use of innovative materials with cutting-edge technologies and better-designed vehicles to increase vehicle payloads. The "star trucks" initiative has already achieved payload increases of 10 percent, leading to subsequent improvements in energy efficiency.

ACHIEVEMENTS

Over the past decade, the pulp and paper industry has made steady progress toward improving its energy efficiency. Energy data for the year 2000 is not yet available. For the period 1990–1999, the pulp and paper industry improved its energy consumption per tonne of output by 11.2 percent. The achievement is consistent with the industry's commitment of a 1-percent improvement in energy efficiency per year from 1990 to 2000. The sector decreased its total energy consumption per tonne of pulp and paper from 29.5 GJ in 1990 to 26.2 GJ in 1999. Over the same period, the consumption of fossil fuel and electricity (excluding biomass) decreased from 14.2 GJ to 11.8 GJ. The portion of total energy supplied by biomass increased from 50.0 percent in 1990 to 54.0 percent in 1999.

Thanks to an ongoing switch to biomass fuel sources, the pulp and paper industry is reducing its use of less environment-friendly fossil fuel sources, despite growing production. The use of biomass, including wood waste, sludge and pulping liquor, has risen by 23 percent, from 378 200 TJ in 1990 to 464 868 TJ in 1999. Over the same period, the use of heavy fuel oil has been reduced by 39.8 percent. As a result, when biomass energy is excluded, it took 16.9 percent less energy to produce a tonne of pulp and paper in 1999 than it did in 1990. When biomass energy is included, the improvement is 11.2 percent.

CHALLENGES

Fuel switching, especially from fossil fuels to biomass fuels, promises to help the sector achieve additional reductions in energy intensity. However, the availability of wood residues (such as bark, sawdust and wood shavings) is limited in many areas, making transportation costs a significant barrier to greater use of residue surpluses in some parts of Canada. Moreover, production curtailments have led to restrictions on capital spending, creating a serious challenge for companies that are seeking to further improve energy efficiency and reduce GHG emissions.

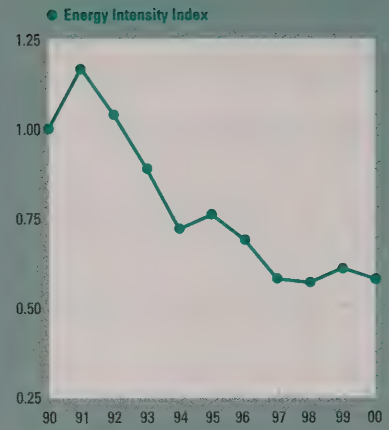
RUBBER

PROFILE: *The rubber products sector comprises establishments that are primarily engaged in manufacturing tires and tubes, automotive parts, rubber hoses and belting, mechanical rubber goods and a wide variety of other products such as rubber and plastic weatherstripping, pressure-sensitive tape, rubber gloves, rubber mats, rubber household products and tire-retreading materials. To meet demand for its products, the rubber products industry employs just over 26 000 people in some 240 facilities nationwide, providing a total payroll of more than $700 million annually.*

PERFORMANCE HIGHLIGHTS

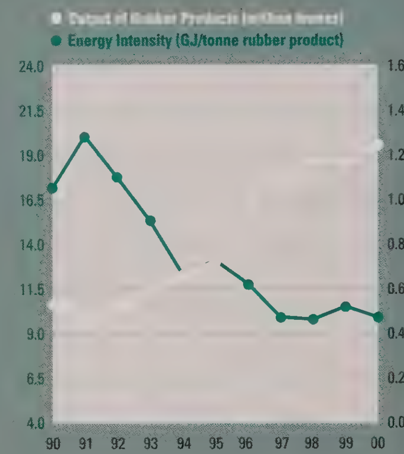
- The rubber products industry employs just over 26 000 people in some 240 facilities nationwide.
- While the total manufacturing industry grew at only 3.0 percent between 1983 and 1987, the rubber industry grew 6.46 percent, the highest average annual growth rate of any industrial sector.
- Twelve tire companies are contributing more than $450,000 to support an energy-saving education program on tires.
- The tire industry is promoting energy-saving wide-base tires for trucking, which can save up to 5 percent in energy consumption.
- Mark IV Automotive Canada Inc. has saved more than 25 percent in annual fuel costs by installing a unique energy-reclaim system.
- Despite the increase in energy consumption demanded by increased production and improved air-emissions quality standards, the sector continues to reduce its energy intensity.

Rubber Sector SIC 15
Energy Intensity Index (1990–2000) Base Year 1990 (1.00)



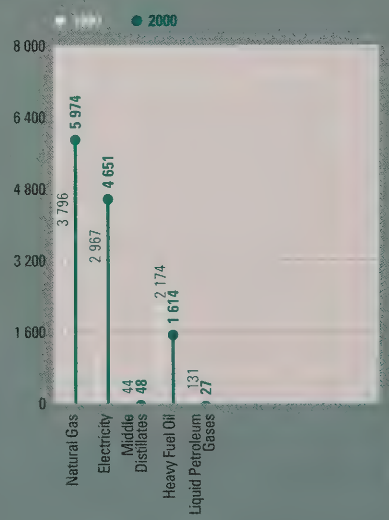
Data source. 1990 and 1996 to 2000, The Rubber Association of Canada (RAC), 2002. Years 1991 to 1995, RAC, 2000.

Rubber Sector SIC 15
Energy Intensity and Physical Output (1990–2000)



Data source: 1990 and 1996 to 2000, The Rubber Association of Canada (RAC), 2002; 1991 to 1995, RAC, 2000.

Rubber Sector SIC 15
Energy Sources in Terajoules per Year (TJ/yr.)



Data source: 1990 and 1996 to 2000, The Rubber Association of Canada (RAC), 2002; 1991 to 1995, RAC, 2000.

ACTIONS

The rubber industry undertook several initiatives in 2000/2001 that are contributing to reduced energy usage. For example, the 12 tire-company members of The Rubber Association of Canada (RAC) agreed to contribute more than $450,000 to support a major consumer education program on tires that will be designed to encourage drivers to save energy by keeping tires properly inflated. Studies show that more than 50 percent of passenger vehicles on the road have at least one tire that is under-inflated by 3 psi or more, contributing to tire failure and a major drain on fuel economy. Properly inflated tires can improve fuel efficiency by up to 5 percent.

The tire industry in Canada is also promoting a new product for the commercial trucking industry, called wide-base tires. With wide-base tires, fewer tires are needed, thereby reducing energy-wasting sidewall friction. As a result, fuel economy is improved by approximately 5 percent, a significant benefit to trucking fleets and to the environment. So far, only Ontario and Quebec have up-to-date trucking regulations that allow these tires, and the RAC and its member companies will continue to educate provincial regulators on their merits.

Individual RAC member firms have also taken action to improve energy efficiency. For example, Mark IV Automotive Canada Inc. has saved more than 25 percent in annual fuel costs by installing a unique energy-reclaim system. The system captures steam and condensate that was previously vented and discharged from the company's vulcanizing process. The company installed new, oversized under-floor vent lines to allow steam to expand and drop in pressure. Vented steam is collected in a flash vessel and transferred to a high-efficiency plate exchanger where boiler feed-water picks up heat from the waste steam. In addition, hot condensate from the vulcanizing process is mixed with make-up water, thereby reclaiming additional heat. The system design has enabled savings of more than 25 percent in natural gas consumption, making it eligible for research and development reimbursements.

ACHIEVEMENTS

The rubber industry's energy performance in 2000/2001 was encouraging. Although production levels of finished product were up 8.1 percent, natural gas consumption rose only 4.6 percent, and electricity consumption dropped 2.4 percent. These numbers indicate a continued improvement in energy usage per unit of output; 48.5 percent of the industry's energy requirements are filled by natural gas, 37.8 percent by electricity and nearly all of the rest by heavy fuel oil.

Based on data collected by the RAC for 2000, total production of the rubber products sector was 1 245 178 tonnes, with a value of approximately $5.48 billion, up from 531 961 tonnes and $2.60 billion in 1990. The majority of the total value of shipments were exports, with more than 95 percent of these going to the United States.

According to Industry Canada's March 2001 report, *Performance of Canada's Manufacturing Sector*, while the total manufacturing industry grew by only 3.0 percent between 1983 and 1987, the rubber industry grew 6.46 percent, the highest average annual growth rate of any industrial sector. Over the same period, energy costs per dollar of output for the rubber sector plunged by more than half (from 2.3 percent to 1.1 percent), while costs for total manufacturing declined by less than a quarter (from 2.9 percent to 2.1 percent).

In absolute terms, energy consumption for the rubber products industry increased between 1990 and 2000, rising from 9115 TJ in 1990 to 12 314 TJ in 2000. However, the sector's gross output increased at a higher rate, leading to a decline in energy intensity over the same period.

CHALLENGES

The rubber industry has become increasingly energy efficient since 1990, a trend aided by pressures to reduce production costs and by the impact of consolidation and industry rationalization. However, although new capital investment could provide opportunities to lower the energy intensity for the sector, such investment may not be made in Canada. Canadian policy-makers must remain cognizant that, within a globally rationalized industry, investment decisions are generally made after a rigid corporate capital pool analysis of all competing international production jurisdictions. Personal and business taxation play a significant role in the decision-making process.

Moreover, government legislation will add significant cost to rubber tire production. For example, in the United States – the destination for most of the Canadian industry's production – recent legislation significantly alters the way tires are marked and has added enormous expense to mould costs. Canadian regulations are harmonized with those in the United States, leading to similar and parallel action on the part of Transport Canada. At a time when the industry faces the pressures of shareholder expectations, market uncertainty, increased energy and raw-material costs and declining margins, it will also face significant additional regulatory overhead.

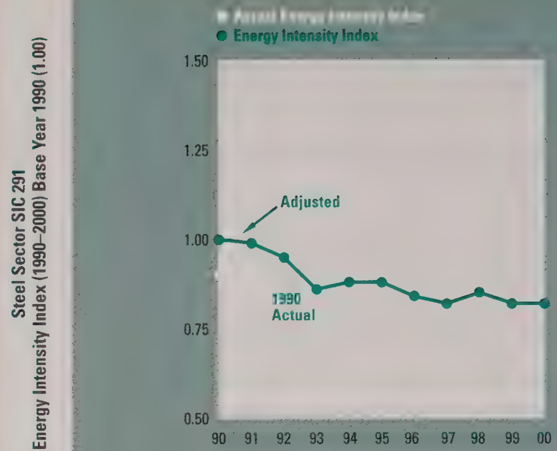
The pending deregulation of electricity in Ontario is a concern to many Canadian rubber manufacturers over the short to mid-term. Many companies fear that there will not be sufficient competition in the market to keep prices down, leading some RAC members to actively explore cogeneration to protect against higher electricity rates.

STEEL

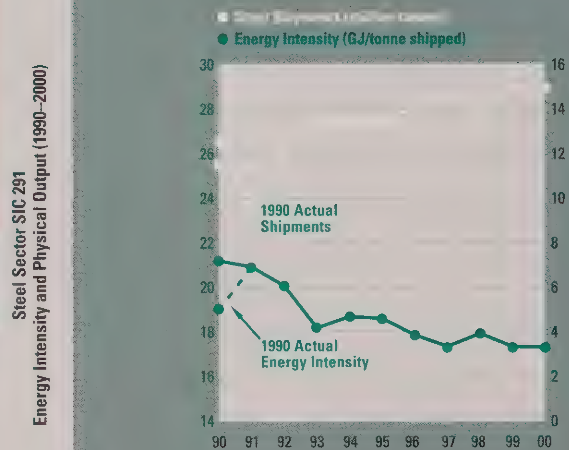
***PROFILE:** Canada's steel sector is one of the country's largest industries, generating annual sales of more than $11 billion, including more than $3 billion in exports. Thirty percent of the steel produced in Canada is directly exported, and as much as 80 percent of the steel made in Canada is ultimately exported as a component of manufactured products. The industry includes 17 plants that directly employ 34 500 workers. The companies that make up the steel sector supply flat-rolled (sheet and plate), long (re-bar and structural steel) and specialty and alloy (stainless and tool steels) products for major markets in the automotive, appliance, oil and gas, machinery, construction and packaging industries. Facilities are located in five provinces, with Ontario accounting for 70 percent of Canadian steel production.*

PERFORMANCE HIGHLIGHTS

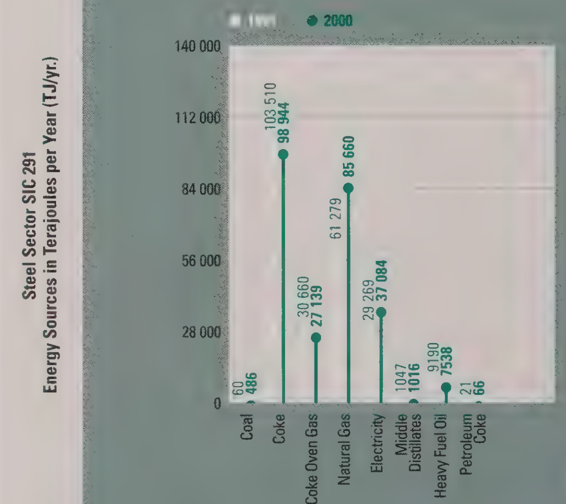
- Canada's steel industry includes 17 plants that melt and pour steel, directly employing 34 500 workers.
- Since 1990, the industry has achieved an 18-percent improvement in energy consumed per tonne shipped.
- Over the 1990–2000 period, the sector's average annual energy efficiency improvement was 1.8 percent, surpassing the industry's commitment of 1 percent per year.
- The sector's energy intensity performance improved slightly from 17.32 in 1999 to 17.29 in 2000.
- More than 90 percent of steel companies, representing more than 90 percent of production, have made commitments to voluntarily improve energy efficiency.



Data source: Statistics Canada, *Quarterly Report on Energy Supply and Demand* (QRESD), December 2001.



Data source: Statistics Canada, *Quarterly Report on Energy Supply and Demand* (QRESD), December 2001.
1990 Adjustments: Canadian Steel Producers Association



Data source: Statistics Canada, *Quarterly Report on Energy Supply and Demand* (QRESD), December 2001.

ACTIONS

Canadian steelmakers continued to invest in programs that improve energy efficiency as part of efforts to upgrade productivity and quality while reducing costs.

AltaSteel Ltd., in Edmonton, Alberta, improved combustion controls and operating practices to reduce the consumption of natural gas in its billet reheat furnace. The company established a computerized preventive maintenance program and replaced water-cooled ducting on its melting furnace with state-of-the-art equipment to reduce delays and improve reliability. Since 1991, AltaSteel has recorded an overall improvement in specific energy consumption of 8 percent.

Stelco Inc. Hilton Works, in Hamilton, Ontario, refurbished its No. 7 coke oven battery and replaced the natural gas cooling system on its E blast furnace with a nitrogen supply and top cooling system. The company introduced more efficient furnace design and improved instrumentation and control systems on its hot strip mill and plate mill reheat furnaces. These investments contributed to an overall energy efficiency improvement of 5 percent since 1989.

Dofasco Inc. of Hamilton, Ontario, introduced a steam-trap maintenance program and replaced a steam-based tar-drying system in its coke production business unit with an energy-efficient chemical treatment process. Improvements and controls introduced within the company's steelmaking business unit increased boiler fuel flexibility to displace purchased fuel with blast furnace gas in the utilities business unit. Combined, energy efficiency projects undertaken by Dofasco in 2000 translated into an annualized 0.85-percent improvement in the plant's energy rate.

Stelpipe Ltd. of Welland, Ontario, modified its Stretch Reducing Mill induction heating furnace control to reduce electricity consumption during idling periods and reduced power consumption peaks by limiting maximum electricity input. Since 1990, the company has improved its specific energy consumption by 60 percent.

Stelfil Ltée of Lachine, Quebec, replaced electroplating rectifiers and a high-voltage transformer and added electronic controls to its patenting line take-up. Since 1991, Stelfil has improved its energy efficiency by 30 percent.

Stelco-McMaster ltée of Contrecoeur, Quebec, installed a new, in-line bar mill, which reduced downtime and cut energy consumption by 14 percent. The company also increased the processing of larger-sized billets, thereby improving continuous casting productivity. Since 1989, the company has achieved a 13-percent overall improvement in specific energy consumption.

Lake Erie Steel Company of Nanticoke, Ontario, upgraded its main boiler to increase the use of blast furnace gas, thereby displacing the use of oil, coke oven gas and electricity. The company also modified its coke side emissions fan to reduce electrical consumption during idle periods and introduced a high-efficiency steel-reheating furnace in its hot strip mill. Overall, since 1990, Lake Erie Steel has improved its energy performance by 24 percent.

ACHIEVEMENTS

The Canadian steel industry produced 16.5 million tonnes of steel and shipped 14.9 million tonnes in 2000. The sector's energy intensity performance improved slightly from 17.32 in 1999 to 17.29 in 2000. Since 1990, the sector has improved its aggregated energy performance by more than 18 percent. This represents an average annual improvement of 1.84 percent, surpassing the industry's commitment to an average 1-percent-per-year improvement for the period.

The Steel Sector Task Force is confident that, between 2000 and 2010, the Canadian steel industry will improve energy intensity by an average of 1 percent per year compared with the 2000 base year. Achieving this target will enable the sector to record an equivalent improvement in energy consumption per tonne shipped of 1.6 percent per year over the 20-year period from 1990.

CHALLENGES

The Canadian steel industry is one of the most modern, high-tech industries in the world. In the last few years, the industry has created new products and opened new markets for steel. Lighter, higher-strength steels are becoming the material of choice for automakers, home builders, appliance manufacturers and others. Over the last decade, the industry has undergone a technological revolution, investing $4.7 billion in plant upgrades and new, innovative machinery. The result has been a dramatic improvement in the products the industry produces and the way in which these products are processed. Thanks to these investments, the industry's productivity growth averaged 14 percent per year through the 1990s.

However, to remain successful and retain the ability to invest in improved energy efficiency and reduced GHG emissions, Canada's steel industry must overcome two critical challenges: unfair international trade practices and an uncompetitive Canadian tax system. Unfair pricing of steel imports through dumping by subsidized foreign competitors continues to be a chronic and growing problem for North American manufacturers. Canada's position is particularly precarious because any unilateral action taken by the United States to support its domestic industry will divert foreign steel from its shores toward Canadian markets, thereby increasing the competitive pressures that Canadian producers face.

Further complicating matters for steelmakers is the Canadian corporate tax structure, which remains significantly higher than that of the United States. This places the Canadian steel industry at a competitive disadvantage with U.S. producers in North American markets and makes it challenging to generate needed capital for continued investments in energy efficiency.

TEXTILES

***PROFILE:** Canada's textiles sector produces the fibres, yarns and fabrics used in industries as diverse as automotive manufacturing, clothing, construction, environmental protection and road building. The textiles sector is organized into three subgroups: primary textiles, textiles products and motor vehicle fabric accessories. Together, the industry sells into 150 markets and exports more than 33 percent of its production.*

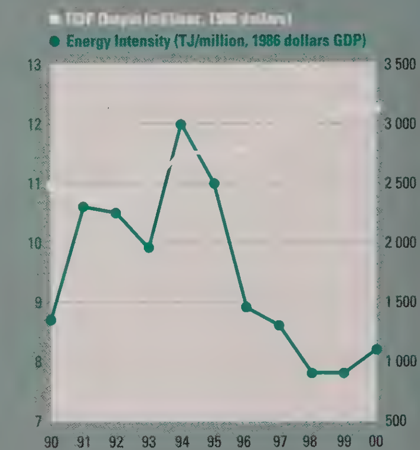
PERFORMANCE HIGHLIGHTS

- Canada's textiles industry sells to 150 markets and exports more than 33 percent of its production.
- The sector's energy mix continues to shift from hydrocarbon sources to electricity.
- In 2000, the industry GDP output was 26 percent higher than in 1990; its energy consumption increased by 18 percent.
- St. Lawrence Corporation reduced its energy use per kilogram of product to 72 percent of 1990 levels between 1990 and 2000.
- From 1990 to 2000, Albarrie Canada Limited achieved a 28-percent reduction in energy use per unit of product.
- DuPont Canada Inc. reduced its energy intensity by almost 32 percent between 1990 and 2000.
- As a result of the industry's efforts to improve the accuracy of reporting by individual companies, Statistics Canada's 2000 data more accurately reflect the industry's actual experience.

Textiles Sector (SICs 18, 19 and 3257)
Energy Intensity Index (1990–2000) Base Year 1990 (1.00)

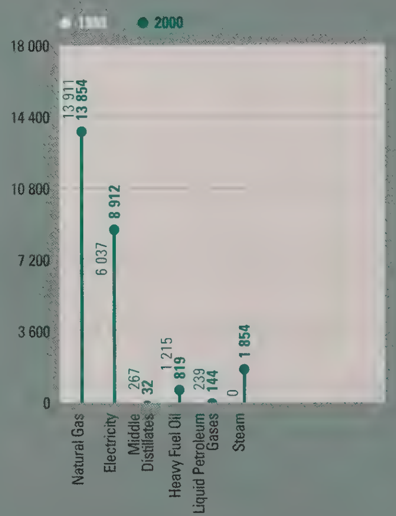
Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC), *Development of Energy Intensity Indicators for Canadian Industry: 1990–2000*, January 17, 2002, Simon Fraser University.

Textiles Sector (SICs 18, 19 and 3257)
Energy Intensity and Economic Output (1990–2000)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC), *Development of Energy Intensity Indicators for Canadian Industry: 1990–2000*, January 17, 2002, Simon Fraser University.

Textiles Sector (SICs 18, 19 and 3257)
Energy Sources in Terajoules per Year (TJ/yr.)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC), *Development of Energy Intensity Indicators for Canadian Industry: 1990–2000*, January 17, 2002, Simon Fraser University.

ACTIONS

Throughout the textiles sector, companies are benefiting from more efficient uses of energy. J.L. De Ball Canada Inc. of Granby, Quebec, was one of the first textiles manufacturers to join the Industrial Energy Innovators Initiative and continues to actively pursue opportunities to improve energy intensity. The company has launched initiatives to improve insulation, replace windows, improve lighting, recover energy from used water and introduce more energy-efficient machinery. Although the company's energy consumption has doubled since 1990, production has increased 2.3 times. Energy use per unit of production in 1999 was 10 percent below 1990 levels.

Consoltex Inc., with headquarters in Saint-Laurent, Quebec, and four manufacturing plants in Quebec and Ontario, also identified opportunities for improved energy efficiency following audits of its facilities. Since 1995, the company has upgraded insulation and lighting and made changes to machinery and processes to cut energy costs while reducing effluent discharges and stack emissions. Consoltex is making strong progress toward a targeted 10-percent reduction in energy use per unit of production. In August 2001, Canada's Climate Change Voluntary Challenge and Registry Inc. (VCR Inc.) recognized Consoltex Inc. as a Silver Level Champion Reporter.

Albarrie Canada Limited of Barrie, Ontario, makes environmental textiles and sells them throughout the world. Strongly committed to improved energy efficiency, Albarrie has reduced energy use per unit of product by 28 percent between 1990 and 2000, well above its 1-percent-per-year energy-reduction target. In September 2001, VCR Inc. recognized Albarrie Canada Limited as a Bronze Level Champion Reporter.

St. Lawrence Corporation of Iroquois, Ontario, produces 70 000 kg per week of terry towels. An Industrial Energy Innovator since 1995, the company has made energy-saving changes in the types of fuel it uses and to its machinery and processes. It has also made special efforts to involve employees in energy efficiency activities. By the end of 2000, these efforts enabled St. Lawrence to reduce its energy use per unit of output to 72 percent of 1990 levels.

DuPont Canada Inc. completed a large performance contract to cut energy expenditures by more than $2.5 million in the adipic acid process at its plant in Maitland, Ontario. The energy-saving facilities covered by the contract began operating in the fall of 2001. This $15-million project will reduce GHG emissions by about 30 000 tonnes on a CO_2-equivalent basis per year. Overall, DuPont Canada reduced its energy intensity by almost 32 percent between 1990 and 2000.

Doubletex Inc., with facilities in Montréal, Quebec, and Toronto, Ontario, is the latest addition to the textiles sector's growing list of Industrial Energy Innovators.

In 2001, the Textiles Energy Task Force met in February, June and September. The task force continues to follow the comprehensive action plan introduced in 1997 and to focus on two principal goals: to broaden participation of textiles manufacturers in the Industrial Energy Innovators program and VCR Inc. and to strengthen the commitment of existing Industrial Energy Innovators. Manufacturers participating in the task force have agreed to demonstrate by example the economic benefits that result from effective energy efficiency programs. Moreover, task force members remain committed to follow up directly and personally with the sector's Industrial Energy Innovators to review their progress in fulfilling their commitment.

The industry continues to conduct its own survey to identify and correct inconsistencies and errors in textiles industry data currently available in government reports. More accurate information will enable the industry to better measure its success in meeting energy efficiency targets. In addition to the industry's own data-gathering activities, the Canadian Textiles Institute is providing a fifth year of financial support to the Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC) at Simon Fraser University.

ACHIEVEMENTS

The textiles sector's energy mix continues to shift from hydrocarbon fuels to electricity. Natural gas consumption declined from 64 percent of total energy consumption in 1990 to 54 percent in 2000. Consumption of other hydrocarbon fuels declined from 8 percent of the mix in 1990 to 4 percent in 2000; electricity's share rose from 28 percent in 1990 to 35 percent in 2000. The textiles industry's GDP output in 2000 was 26 percent higher than in 1990, and its total energy usage increased by 18 percent. As a result of the industry's efforts to improve the accuracy of reporting by individual companies, Statistics Canada's 2000 data more accurately reflect the industry's actual experience.

The Textiles Energy Task Force has committed the industry to an energy intensity target of 1 percent per year for the period 2000–2010. The sector's efforts to reach this goal will build on its energy efficiency performance improvements since 1995 and reflect ongoing consultations to meet Canada's Kyoto goals.

CHALLENGES

The task force believes that one of its key challenges is to gain the active participation of more of the industry's major producers as Industrial Energy Innovators. Task force members continue to lead in efforts to broaden this participation.

In addition to developing methods to measure energy use more accurately, increased efforts are required to sensitize those in the textiles industry to the long-term implications of Canada's Kyoto goals and to encourage active participation in Canada's new National Implementation Strategy on Climate Change. To this end, the Textiles Energy Task Force made a presentation to industry senior management at the June 2001 annual conference of the Canadian Textiles Institute.

During 2001, the Textiles Energy Task Force and the Canadian Textiles Institute have devoted significant time and resources to addressing these challenges. These organizations plan to continue and intensify their efforts.

TRANSPORTATION EQUIPMENT MANUFACTURING

PROFILE: *The Canadian transportation equipment manufacturing sector includes companies that manufacture aircraft, aircraft parts, automobiles, motor vehicle parts, trucks, buses, trailers, military vehicles, railroad rolling stock, ships and pleasure boats. The sector is a major part of the Canadian economy, accounting for nearly 3 percent of Canada's GDP and more than 15 percent of the total manufacturing GDP in 2000. Including dealers, parts and distribution networks, the sector employs more than 500 000 people across Canada.*

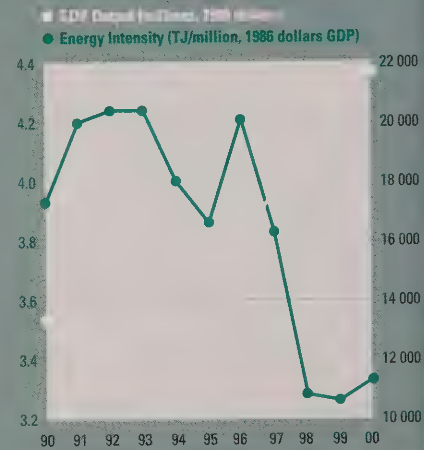
PERFORMANCE HIGHLIGHTS

- Despite a severe downturn in the economy at the end of 2000, the value of the total output of the transportation equipment manufacturing sector for the year grew by 0.85 percent.
- Between 1990 and 2000, the sector recorded an overall improvement in energy intensity of 15 percent.
- Bombardier Inc. joined the task force in 2001, bringing aircraft industry representation.
- General Motors of Canada Limited implemented energy efficiency projects that led to annual savings of more than 3.2 million kWh of electricity.
- Ford Motor Company of Canada, Limited replaced inefficient heating systems at two assembly plants, which resulted in annual energy savings of $2 million.
- Bombardier's de Havilland Plant has reduced consumption of electricity by 2.5 percent and natural gas by 3 percent, despite a 40-percent increase in production.

Transportation Equipment Manufacturing Sector SIC 3231
Energy Intensity Index (1990–2000) Base Year 1990 (1.00)

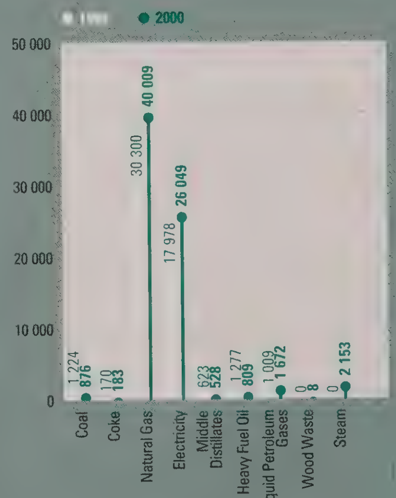
Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC), *Development of Energy Intensity Indicators for Canadian Industry: 1990–2000*, January 17, 2002, Simon Fraser University.

Transportation Equipment Manufacturing Sector SIC 3231
Energy Intensity and Economic Output (1990–2000)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC), *Development of Energy Intensity Indicators for Canadian Industry: 1990–2000*, January 17, 2002, Simon Fraser University.

Transportation Equipment Manufacturing Sector SIC 3231
Energy Sources in Terajoules per Year (TJ/yr.)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC), *Development of Energy Intensity Indicators for Canadian Industry: 1990–2000*, January 17, 2002, Simon Fraser University.

ACTIONS

The CIPEC Transportation Equipment Manufacturing Task Force continued its tradition of promoting energy efficiency at its fifth annual "One Day Energy Conference" held at General Motors of Canada Limited headquarters in Oshawa, Ontario. Another annual energy conference is scheduled for the first quarter of 2002.

During 2001, the task force met nine times to develop an action plan, receive energy efficiency updates, review future electricity trading floors and develop conferences and outreach programs to encourage others to join. Bombardier Inc. joined the task force in 2001, bringing aircraft industry representation.

Individual sector members have made significant advances in energy efficiency. Following are examples.

General Motors of Canada Limited implemented numerous energy efficiency projects in 2000 that resulted in annual savings of more than 3.2 million kWh of electricity and 188 million gallons of water. These projects included shutting off non-productive electrical loads, improving heating and ventilation, reducing water usage and upgrading compressed-air systems. One significant project involved process modifications to enable the recirculation of humidity water in the Oshawa Truck Plant in Oshawa, Ontario, saving more than 169 million gallons of water annually.

In Oakville, Ontario, Ford Motor Company of Canada, Limited's Oakville Assembly Plant, in conjunction with the adjacent Ontario Truck Plant, replaced an inefficient steam heating system with direct-fired natural gas systems located at each main assembly building. The company estimates that this project will net energy savings of $2 million per year and result in a substantial reduction in heating system maintenance costs.

Over the past two years, Bombardier's de Havilland Plant in Downsview, Ontario, has increased production by more than 40 percent, yet reduced the consumption of electricity and natural gas by 2.5 percent and 3 percent, respectively. These reductions result from the implementation of several programs, including process optimization, revitalized energy-conservation programs, ISO 14001 initiatives and Six Sigma blitzes, which involve the modification of current operating procedures.

The Transportation Equipment Manufacturing Task Force continues to pursue the activities outlined in its 2001/2002 action plan. Specific elements of the plan include the following:

- Continue to provide leadership and promote energy efficiency among industries throughout the transportation manufacturing sector. The sector's current target is to improve its energy intensity by 1.0 percent per year for the period 2001–2005.
- Host annual energy conferences and support other workshops and forums that are beneficial to the sector.
- Recruit new companies and associations in the sector to the task force.
- Actively encourage companies to submit action plans to Canada's Climate Change Voluntary Challenge and Registry Inc. (VCR Inc.) and the Industrial Energy Innovators Initiative.
- Promote the Energy Resource Management System (ERMS) program in the automotive parts sub-sector and encourage its expansion for use in other sectors.

ACHIEVEMENTS

Although 2000 ended with a severe downturn in the economy, the value of the total output of the transportation equipment manufacturing sector for the year still grew by 0.85 percent, due mainly to continued expansion in the automotive parts industry. Energy usage for the year increased by 4.76 percent over 1999, a rate considerably higher than output growth. Consequently, energy intensity increased by 2.2 percent. In 2000, the sector consumed 72 290 TJ of energy, up 37.5 percent from 1990. Over the same period, gross output increased by 71 percent, leading to an overall improvement in energy intensity of 15 percent.

Energy use by fuel type has remained fairly constant since 1990, with natural gas (55 percent) and electricity (36 percent) making up the bulk of the energy used. Liquid petroleum gases, middle distillates (No. 2 fuel oil), heavy fuel oil and coal use have reversed a steady decline and increased 14.5 percent in 2000, due largely to the rapid escalation of natural gas prices. The use of these fuels will undoubtedly continue to increase until natural gas prices return to former levels.

CHALLENGES

The downturn in the economy, especially in the automotive sector, has had a detrimental effect on energy intensity. Despite suddenly higher natural gas costs, economically motivated plant downtime has led to the under-utilization of facilities, thereby causing energy intensity numbers to soar, despite an overall decrease in energy usage. Although the transportation equipment manufacturing sector is committed to continuously improving quality, environmental performance and energy efficiency, investment-payback requirements of less than two years and internal competition for funds are challenging energy managers who are seeking to make major gains. Moreover, energy efficiency improvements arising from the implementation of new technology are likely to be offset by trends that are driving energy use higher. These trends include the increased use of cooling to improve working conditions, more demanding pollution control and a shift to more energy intensive products and processes.

Between 1990 and 2000, GHG emissions increased by 35 percent, despite the sector's best efforts. It is improbable that the sector will meet a sector-specific target that parallels Canada's Kyoto goal to reduce overall emissions by 6 percent below 1990 levels. Sector companies are already efficient energy users, and there are relatively few cost-effective opportunities for dramatic gains, even with high energy costs. Unless there are major advances in technology, energy efficiency improvements are likely to come in small increments.

UPSTREAM OIL AND GAS

PROFILE: *The upstream oil and gas sector includes the companies that find and develop Canada's vast hydrocarbon reserves. This dynamic oil and natural gas exploration and production industry is represented by the Canadian Association of Petroleum Producers (CAPP) and the Small Explorers and Producers Association of Canada (SEPAC). The member companies of these associations account for more than 99 percent of the crude oil and natural gas produced in Canada. The industry is a major economic force, with one of every 30 jobs in Canada directly or indirectly tied to the oil and natural gas sector.*

PERFORMANCE HIGHLIGHTS

- The Canadian Association of Petroleum Producers' (CAPP's) 150 member companies account for more than 97 percent of the crude oil and natural gas produced in Canada.
- CAPP's Stewardship initiative encourages members to continually improve their environmental, health and safety performance.
- A province-wide effort in Alberta by CAPP members led to a reduction in flaring of 38 percent below 1996 levels by the end of 2000.
- Conoco Canada reduced its emissions by approximately 65 000 tonnes of CO_2 equivalent per year in 2000.
- In 2000, Chevron Canada Resources reduced its flare gas volumes by 6 percent and recorded an impressive solution gas conservation rate of 99.7 percent.
- Actions taken by ExxonMobil Canada have reduced its production carbon intensity by 5 percent over four years.
- Richland Petroleum Corporation now captures previously flared solution gas and diverts it for use as fuel for pumpjacks and lineheaters.
- Pioneer Natural Resources Canada Inc. reduced its energy consumption by 43 percent over 10 years.
- BP Canada Energy Company has begun retrofitting its compressor engines with more energy-efficient air-fuel ratio controllers.

The sector is currently working with the Office of Energy Efficiency of Natural Resources Canada to develop indices and figures.

ACTIONS

The upstream oil and gas sector is a strong proponent of environmental performance and energy conservation. In 1999, CAPP established its Stewardship initiative, a voluntary program that encourages members to continually improve their environmental, health and safety performance and to report their progress to stakeholders.

The industry is also a key participant in the Clean Air Strategic Alliance (CASA), a multi-stakeholder group that includes regulators, non-governmental organizations and industry, established to develop strategies to improve Alberta's air quality. In 1998, CASA developed a framework for managing the reduction of natural gas flaring in Alberta. Accordingly, by the end of 2000, operators reduced flaring in Alberta by 38 percent below 1996 levels, surpassing 2001 targets.

The industry is now working with CASA to develop a management framework to deal with vented emissions in the province. Venting happens when individual wells release small amounts of methane directly to the atmosphere. The total of such emissions increased significantly from 1999 to 2000, largely due to improved reporting and increased heavy oil production.

In recent submissions to Canada's Climate Change Voluntary Challenge and Registry Inc. (VCR Inc.), 28 CAPP member companies reported more than 300 emissions-reduction projects undertaken between 1999 and 2001 and planned for 2002. These projects included reductions in the use of fuel and electricity, lowered methane releases and improved process efficiencies. Total emissions reductions from conventional oil and gas operations tallied in these reports were 6.7 megatonnes of CO_2 equivalent, while oil sands reported reductions of 6.3 megatonnes of CO_2 equivalent.

Individual petroleum producers have made significant strides toward improved energy efficiency and reduced GHG emissions. Following are examples.

Conoco Canada reported that GHG-reduction projects implemented in 2000 and 2001 cut its emissions by approximately 65 000 tonnes of CO_2 equivalent per year, with a further reduction of 112 000 tonnes planned for 2002. Combined, these reductions represent a total decrease in GHG emissions of 7.4 percent.

Chevron Canada Resources has implemented a software database that provides the company with a corporate-wide structure for reporting energy consumption and GHG emissions estimates. In 2000, Chevron reduced its flare gas volumes by 6 percent and recorded an impressive solution gas conservation rate of 99.7 percent.

ExxonMobil Canada achieved its 1997 goal by reducing its production carbon intensity by 5 percent over four years. These actions reduced the company's overall CO_2-equivalent emissions by a total of 1.14 kilotonnes per year. The company has now set its target at a further reduction of 2 percent per year.

Richland Petroleum Corporation captures previously flared solution gas for use as fuel for pumpjacks and lineheaters. The company converts pneumatic instrumentation in order to use air instead of natural gas. Richland has also installed vapour recovery units to reduce methane and volatile organic compounds emissions.

Since 1990, Pioneer Natural Resources Canada Inc. has reduced its energy consumption from 2 170 179 GJ to 1 239 400 GJ per year, a 43-percent improvement. Due to the combination of large and small energy efficiency actions over the same period, the company has reduced its CO_2-equivalent emissions by 39 percent.

BP Canada Energy Company has begun retrofitting "rich burn" turbocharged compressor engines in its natural gas operations with REMVue™ air-fuel ratio controllers, which reduce the amount of fuel needed to produce the same amount of work energy. These controls reduce fuel consumption by an average of 15 percent, thereby cutting CO_2 emissions by 10 percent, NO_x by 50 percent and CO by 90 percent.

Talisman Energy Inc. now scrutinizes equipment purchases to ensure that new devices meet energy efficiency standards. The company also designs its field systems to eliminate unnecessary energy drains and is improving energy tracking by installing new energy data management software.

ACHIEVEMENTS

The upstream oil and gas sector is a recent addition to the CIPEC family. As part of its commitment to CIPEC, the sector has implemented a common energy reporting system. This enables a meaningful and consistent gathering of energy use and carbon intensity data. The sector has piloted and conducted a number of energy workshops and has conducted a number of "Dollars to $ense" workshops in 2001, including the "Monitoring and Tracking" and "Energy Master Plan" workshops.

Under the leadership of CAPP and SEPAC, the sector is firmly committed to sound environmental principles and will intensify its focus on energy efficiency. Member companies have already made significant strides in this direction and are continuing to take individual actions that, when combined, make a significant contribution to Canada's efforts to improve its competitiveness while working to meet its international climate change goals.

CHALLENGES

Rising energy demands and higher prices have driven the rapid increase in exploration and development. Greater activity in the field translates into more energy consumption. This makes a reduction of overall energy use within the sector unlikely in the short term. However, sector companies have made substantial progress in reducing their energy intensity and, subsequently, their carbon intensity. With the introduction of a standardized energy-reporting format in 2001, the sector has begun to build a meaningful base of energy data in order to measure its progress in the years ahead.

Petroleum exploration, development and processing companies are aware of the economic and environmental benefits of improved energy efficiency and are committed to continuing to implement measures that reduce waste and improve energy intensity.

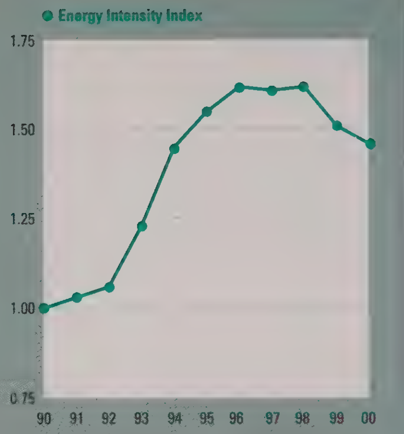
WOOD PRODUCTS

PROFILE: *The wood products sector includes sawmills, planing mills and shingle mills that manufacture products that range from timber to finished lumber for domestic and world markets. At the end of 2000, the industry consisted of nearly 3000 establishments across Canada that employed just under 20 000 workers.*

PERFORMANCE HIGHLIGHTS

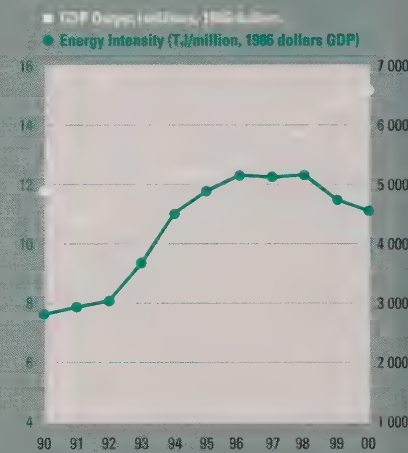
- In 2001, Weldwood of Canada lowered its GHG emissions to 1990 levels by reducing fossil fuel consumption and substituting energy from forest by-products.
- Domtar Inc. modernized five small log sawlines in Quebec and Ontario by installing equipment that is more efficient.
- Canfor Corporation is studying cogeneration projects that could offset emissions of 107 000 tonnes of CO_2 equivalent per year.
- Erie Flooring and Wood Products and Madawaska Doors Inc. have signed on as Industrial Energy Innovators.
- Wood products companies continue to develop cost-effective biomass energy systems to replace systems that use costly natural gas and electricity.

Wood Products Sector SIC 25
Energy Intensity Index



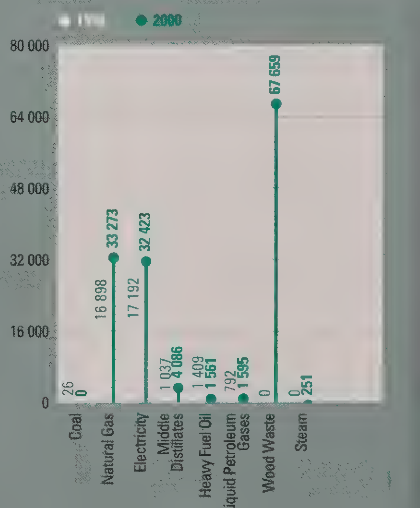
Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC), *Development of Energy Intensity Indicators for Canadian Industry: 1990–2000*, January 17, 2002, Simon Fraser University.

Wood Products Sector SIC 25
Energy Intensity and Economic Output (1990–2000)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC), *Development of Energy Intensity Indicators for Canadian Industry: 1990–2000*, January 17, 2002, Simon Fraser University.

Wood Products Sector SIC 25
Energy Sources in Terajoules per Year (TJ/yr.)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC), *Development of Energy Intensity Indicators for Canadian Industry: 1990–2000*, January 17, 2002, Simon Fraser University.

ACTIONS

Forest product companies are actively building energy efficiency through capital investment and the improvement of operating methods. For example, Weldwood of Canada Limited uses innovative technologies in all of its operations to support its strong commitment to the environment. Weldwood's wood products facilities maximize wood use, diverting wood residues to fabricate new products such as fibreboard and finger-jointed lumber or to produce energy. Over the past decade, Weldwood has achieved significant success in reducing GHG emissions despite increasing its overall production. In 2001, the company met its goal of lowering GHG emissions to 1990 levels by reducing fossil fuel consumption and substituting energy from forest by-products, such as wood shavings, which are used as fuel.

Domtar Inc.'s wood products group has modernized five small log sawlines in Quebec and Ontario with more efficient equipment using variable frequency electrical drives. The installations improved fibre yields as well as energy consumption efficiency. In a joint partnership with Anthony Forest Products Co. of Eldorado, Arkansas (Anthony-Domtar Inc.), Domtar built and commissioned a state-of-the-art plant to manufacture engineered wood I-joists in Sault Ste. Marie, Ontario. The company has several other projects underway that will help to improve Domtar's overall energy efficiency.

Canfor Corporation, based in Vancouver, British Columbia, is considering projects at its Fort St. James and Chetwynd sawmills that will directly reduce GHG emissions by substituting wood-residue-derived heat for natural gas in mill lumber-drying kilns. Collectively, these projects could offset approximately 26 000 tonnes carbon dioxide equivalent (CO_2e) of GHG emissions. Canfor is also studying cogeneration projects that could offset as much as 2208 TJ of natural gas, or approximately 107 000 tonnes of CO_2 equivalent.

In Alberta, Canfor will supply 112 000 bone dry tonnes (Bdt) of mill residues to a planned 25-MW cogeneration facility located at the company's Grande Prairie sawmill site. In addition to the "green" electricity produced, the project will supply more than 200 000 GJ of heat to offset natural gas consumed by lumber-drying kilns, directly reduce Canfor's GHG emissions by approximately 11 000 tonnes CO_2e, and offset a further 22 000 tonnes by reducing its electricity consumption from the Alberta grid. In 2000, GHG emissions per unit of production at Canfor's sawmills were 82.7 tonnes CO_2e per thousand board feet (Mfbm), a decrease of 10.2 percent from the 1990 level of 92.1 tonnes CO_2e/Mfbm.

As part of energy awareness initiatives begun in 2001, Erie Flooring and Wood Products of West Lorne, Ontario, and Madawaska Doors Inc. of Barrie, Ontario, signed on as Industrial Energy Innovators. The companies received an audit incentive from Natural Resources Canada to identify energy efficiency opportunities that their respective plants can implement to lower energy use, cut production costs and demonstrate support for Canada's GHG-reduction goals.

In 2001, Forintek Canada Corp. launched an energy-benchmarking project that will support the CIPEC Wood Products Sector Task Force's efforts to promote energy efficiency in the solid wood industry. Forintek will study industry performance in Canada and abroad to develop the benchmarking data needed to establish energy efficiency targets, action plans and policies within the sector's companies.

ACHIEVEMENTS

The wood products sector consumed 73 192 TJ of fossil fuels and electricity in 2000. Strong demand for the industry's products has increased the sector's production by 50 percent over the last decade. In turn, this has led to a rise in the total energy consumed by the sector over the same period. Due to measures taken to improve energy efficiency, energy intensity has improved over the last five years.

The impact on production costs brought by fluctuating energy prices provides an additional incentive for wood products companies to identify and implement low-cost energy efficiency measures. Companies continue to develop cost-effective biomass energy systems to displace the use of costly natural gas and electricity. However, ongoing adverse economic factors continue to impair the sector's energy efficiency efforts and are forcing companies to develop new, higher-value products and to pursue new markets. These efforts often lead to the production of goods that require higher rates of energy consumption.

CHALLENGES

Companies in the wood products sector have continued to make investments and introduce measures that improve energy efficiency. However, the ability to make such investments depends directly on the strength of the sector's markets and favourable pricing both at home and abroad. Unfortunately, actions taken against the importation of Canadian softwood lumber by the United States has had a serious impact on the Canadian forest products industry. These actions have impaired the flow of Canadian lumber into the U.S. market, thereb creating a glut of product in the domestic market. In turn, this glut has reduced Canadian lumber prices to their lowest levels in yea

Canadian companies have responded by closing facilities and alloc production to fewer mills in an attempt to maintain production e at sustainable levels. However, weak prices and shrinking markets combined to make it exceedingly difficult for most forest produ companies to make investments in energy efficiency. While the closure of facilities will reduce the sector's total energy consumption over the short term, the lack of investments in energy efficiency make it unlikely that the industry will be able to make significant improvements in energy intensity.

INDUSTRIAL ENERGY INNOVATORS BY SECTOR

Through Natural Resources Canada's Office of Energy Efficiency (OEE), the Industrial Energy Innovators program focuses on transforming the sector-level commitments made by the task forces into company-level action by helping to overcome obstacles to energy efficiency at the company level.

As of April 1, 2002, 314 manufacturing and mining companies – representing approximately 85 percent of industrial energy use in Canada – have signed on as Industrial Energy Innovators. The majority of these companies are participants in VCR Inc.

For information on becoming an Industrial Energy Innovator, contact the OEE by e-mail at cipec.peeic@nrcan.gc.ca or visit the Web site at http://oee.nrcan.gc.ca/cipec.

INDUSTRIAL ENERGY INNOVATORS

Aluminum
Alcan Inc.
Alcoa – Aluminerie de Baie-Comeau
Alcoa – Aluminerie de Bécancour inc
Alcoa – Aluminerie Lauralco inc.
Aluminerie Alouette inc.

Cement
Blue Circle Cement
ESSROC Canada Inc.
Inland Cement Limited
Lafarge Canada Inc.
St. Lawrence Cement Inc.
Tilbury Cement Ltd.

Chemicals
Chinook Group Limited – Sombra Plant
Degussa-Hüls Canada Inc.
DuPont Canada Inc.
Elementis Pigments Canada
MDS Nordion Inc.
Nacan Products Limited
NOVA Chemicals Corporation
OxyVinyls Canada Inc.
PolyOne Canada Inc.
Rohm and Haas Canada Inc.

Electrical/Electronics
ASCOlectric Ltd.
Broan-NuTone Canada
Camco Inc.
Century Circuits Inc.
Honeywell Limited
IBM Canada Ltd.
Nortel (Northern Telecom Limited)
Osram Sylvania Ltd.
Vansco Electronics Ltd.

Electricity Generation
Ontario Power Generation Inc.

Food and Beverage
Alberta Processing Co., A Division of West Coast Reduction Ltd.
Andrés Wines Ltd.
API Grain Processors
Armstrong Cheese Company Ltd. – Alberta
Better Beef Ltd.
Big Rock Brewery Ltd.
Black Velvet Distilling Co.
Borden Foods Canada
Burnbrae Farms Ltd. – Mississauga
Canada West Foods J.V. Inc.
Canamera Foods
Canbra Foods Ltd.
Canyon Creek Soup Company Ltd.
Cargill Animal Nutrition – Camrose Plant
Cargill Animal Nutrition – Lethbridge Plant
Carson Foods
Casco Inc.
Champion Petfoods
Coca-Cola Bottling Ltd.
Cuddy Food Products
Family Muffins & Desserts Inc.
Foothills Creamery
Garden Province Meats Inc.
H.J. Heinz Company of Canada Ltd.
Heritage Frozen Foods Ltd.
Hubberts Industries
Hub Meat Packers Ltd. – Sunrise Brand
Kraft Canada Inc.
Labatt Breweries of Canada
Legal Alfalfa Products Ltd
Lilydale Cooperative Ltd.
Lone Pine Cheese Ltd
Maple Leaf Consumer Foods
Maple Leaf Pork – Alberta
Maple Leaf Pork – Ontario
Maple Lodge Farms Ltd.
Marsan Foods Limited
McCain Foods (Canada) – Alberta, A Division of McCain Foods Limited
Molson Breweries – Edmonton Brewery
Molson Canada – Ontario
Moosehead Breweries Ltd.
Nestlé Canada Inc
Northern Alberta Processing Co., A Division of West Coast Reduction Ltd
Oakrun Farm Bakery Ltd.
Olymel, L.P.
Parmalat Canada Ltd. – Alberta
Parmalat Dairy and Bakery Inc.
Pepsi-Cola Canada Beverages
Pine River Cheese and Butter Co-operative
Prairie Mushrooms (1992) Ltd.
Principality Foods Ltd
Quality Fast Foods
Sakai Spice (Canada) Corporation
Schneider Foods
Sleeman Brewing and Malting Co. Ltd
Sunrise Bakery Ltd.
Sun-Rype Products Ltd.
Sun Valley Foods Canada
Transfeeder Inc.
Trochu Meat Processors
Unifeed Premix
Versacold Corporation
Westcan Malting Ltd
Westglen Milling Ltd.
Weston Foods Inc.

Foundry
Ancast Industries Ltd.
Bibby-Ste-Croix
Crowe Foundry Limited
ESCO Limited – Port Hope Operations
Eureka Foundry Corporation (A Subsidiary of ACI Canada Inc.)
Gamma Foundries Limited
Grenville Castings Limited
Ramsden Industries Limited
Vehcom Manufacturing (A Division of Comtech Mfg. Ltd.)
Wabi Iron & Steel Corporation

General Manufacturing
3M Canada Inc.
ABCO Property Management Inc.
Bentofix Technologies Inc.
Canadian Uniform Limited
Champion Feed Services Ltd.
Coyle & Greer Awards Canada Ltd
Crown Cork & Seal Canada Inc
EMCO Limited – Building Products
Envirogard Products Ltd.
Escalator Handrail Company Inc
Euclid-Hitachi Heavy Equipment Ltd
Federated Co-operatives Limited
Ferraz Shawmut Canada Inc
Fibrex Insulations, Inc
Garland Commercial Ranges Limited
Greif Containers Inc
Imperial Home Decor Group Canada Inc
Imperial Tobacco Limited
Interface Flooring Systems (Canada) Ltd
International Paper Industries Ltd
Jones Packaging Inc
Kindred Industries
Kodak Canada Inc
LePage (Division of Henkel Canada Limited)
Madawaska Doors Inc.
Maksteel Service Centre (Division of Makagon Industries Ltd.)
Metroland Printing, Publishing & Distributing Ltd
Owens Corning Canada Inc. – Toronto Plant
Polytainers Inc.
PRO-ECO Limited
S.C. Johnson and Son, Limited
Sandvik Tamrock Canada Inc
Sandvik Tamrock Loaders Inc.
Scapa Tapes North America
Simmons Canada Inc.
Soprema Inc. (Drummondville Plant)
Superior Radiant Products Ltd.
Teknion Furniture Systems Inc
VicWest Steel
Wabash Alloys Ontario
Wyeth-Ayerst Canada Inc

Lime
Beachville Lime Limited
Chemical Lime Company of Canada Inc.
Dundas Lime Limited
Graymont (NB) Inc.
Graymont (QC) Inc.
Graymont Western Canada Inc.
Northern Lime Limited

Mining
Aur Resources Inc.
Barrick Gold Corporation – La Mine Doyon (Division of Cambior Inc.)
BHP Billiton Diamonds Inc.
Boliden Limited
Canadian Electrolytic Zinc Limited
Echo Bay Mines Ltd. – Lupin Operation
Falconbridge Limited
Fonderie Horne – Métallurgie Noranda inc.
Hillsborough Resources Limited
Hudson Bay Mining & Smelting Co., Ltd.
Inco Limited
International Minerals and Chemicals (Canada) Global Limited (IMC Kalium Canada Ltd.)
Iron Ore Company of Canada
Mines et exploration Noranda inc. – Division Matagami
Mines Wabush (Managed by Compagnie Minière Cliffs inc.)
Newmont Canada Limited, Golden Giant Mine
Noranda Inc. – Brunswick Mining Division
Noranda Inc. – Brunswick Smelter
Noranda Metallurgy Inc. (Canadian Copper Refinery)
Placer Dome Canada Limited
Quebec Cartier Mining Company
Syncrude Canada Ltd.
Teck Cominco Limited

Petroleum Products
Canadian Tire Petroleum
Chevron Canada Limited – Burnaby Refinery
Enbridge Pipelines Inc.
Husky Energy Inc.
Imperial Oil Limited
Irving Oil Limited
Parkland Refining Ltd.
Petro-Canada
Safety-Kleen Corp.
Shell Canada Products Limited
Suncor Energy Inc. – Sunoco Group
Ultramar Ltd. (Saint-Romuald Refinery)

Plastics
Downeast Plastics Ltd.
Husky Injection Molding Systems Ltd.
The Clorox Company of Canada, Ltd.
Par-Pak Ltd.

Potash
Potash Corporation of Saskatchewan Inc.
– Allan Division
– Cory Division
– Lanigan Division
– New Brunswick Division
– Patience Lake Division
– Rocanville Division

Pulp and Paper/Forestry
Abitibi-Consolidated Inc.
Bowater Canadian Forest Products Inc.
Canfor Corporation
Cariboo Pulp and Paper Company Limited
Cascades Inc.
Domtar Inc.
Emballages Smurfit-Stone Canada inc. – La Tuque Plant
Erie Flooring and Wood Products
Eurocan Pulp & Paper Company Limited
F.F. Soucy Inc.
Kruger Inc.
Lake Utopia Paper
Marathon Pulp Inc.
Marcel Lauzon Inc.
Maritime Paper Products Limited
Nexfor Inc.
Norampac Inc. (Division of Cascades Inc.)
NorskeCanada
Paperboard Industries International Inc. (Division of Cascades Inc.)
Papiers Stadacona
Perkins Papers Inc. (Division of Cascades Inc.)
Riverside Forest Products Limited, Armstrong Division
Rolland Inc. (Division of Cascades Inc.)
St. Marys Paper Ltd.
Stora Enso North America, Port Hawkesbury Mill
Stowe Woodward Co. (British Columbia) (Division of Cascades Inc.)
Tembec Inc.
Tembec Paper Group – Spruce Falls Operations
Tolko Manitoba Kraft Papers
UPM-Kymmene Corporation
Weldwood of Canada Limited
West Fraser Timber Co. Ltd.
Weyerhaeuser Canada Ltd.

Rubber
Michelin North America (Canada) Inc.
NRI Industries Inc.

Steel
Algoma Steel Inc.
AltaSteel Ltd.
Atlas Specialty Steels (A Division of Slater Stainless Corp.)
CHT Steel Company Inc.
Co-Steel LASCO
Dofasco Inc.
Gerdau Courtice Steel Inc.
Hilton Works (A Division of Stelco Inc.)
Ivaco Inc. (Ivaco Rolling Mills)
Lake Erie Steel Company (A Division of Stelco Inc.)
Laurel Steel (Division of Harris Steel Limited)
QIT – Fer et Titane inc.
Slater Steel Inc. – Hamilton Specialty Bar Division
Stelco Inc.
Stelco-McMaster ltée
Stelfil Ltée
Stelpipe Ltd.
Stelwire Ltd.
Sydney Steel Corporation
Welland Pipe Ltd.

Textiles
Agmont Inc.
Albarrie Canada Limited
Barrday Inc.
Beaulieu Canada Inc.
Bennett Fleet (Quebec) Inc.
Britex Group (The)
C.S. Brooks Canada Inc. (Magog)
Cambridge Towel Corporation (The)
Cavalier Textiles
Coats and Clark Canada
Coats Bell
Collingwood Fabrics Inc.
Collins & Aikman Canada Inc.
Consoltex Inc.
CookshireTex inc.
Denim Swift
Doubletex Inc.
Fabrene Inc.
J.L. De Ball Canada Inc.
LaGran Canada Inc.
Lincoln Fabrics Ltd.
Manoir Inc.
Monterey Textiles (1996) Inc.
Nova Scotia Textiles, Limited
PGI-DIFCO Performance Fabrics Inc.
Spinrite Inc.
St. Lawrence Corporation
Stedfast Inc.
Velcro Canada Inc.
VOA Colfab Inc.

Transportation Equipment Manufacturing
Accuride Canada Inc.
Air Canada Technical Services
Boeing Toronto Limited
Bombardier Inc. – Valcourt Plant
Cami Automotive Inc.
Canadian General-Tower Limited
DaimlerChrysler Canada Inc.
Dresden Industrial, A Division of KSR International Co.
Dura Automotive Systems (Canada), Ltd.
Ford Motor Company of Canada, Limited
General Motors of Canada Limited
Honda of Canada Mfg.
International Truck and Engine Corporation Canada
Oetiker Limited
Orenda Aerospace Corporation
Orion Bus Industries Inc.
Oxford Automotive, Inc. – Suspension Division, Chatham
Polywheels Manufacturing Ltd.
Pratt & Whitney Canada Inc.
Presstran Industries
Prévost Car Inc.
Rockwell Automation Canada Inc.
Russel Metals Inc.
Sterling Trucks, A Division of Freightliner Limited
Toyota Motor Manufacturing Canada Inc.
TRW Automotive
Volvo Cars of Canada Ltd.
Woodbridge Group (The)

Upstream Oil and Gas
BP Canada Energy Company
Nexen Inc.
Paramount Resources Ltd.

NATURAL RESOURCES CANADA STAFF

Carol Buckley
Director
Industrial, Commercial and Institutional Program Division
Office of Energy Efficiency
Natural Resources Canada
580 Booth Street, 18th Floor
Ottawa ON K1A 0E4
Tel.: (613) 996-4079
Fax: (613) 947-4121
E-mail: cbuckley@nrcan.gc.ca

Philip B. Jago
Senior Chief
Industrial Energy Efficiency
Office of Energy Efficiency
Natural Resources Canada
580 Booth Street, 18th Floor
Ottawa ON K1A 0E4
Tel.: (613) 995-6839
Fax: (613) 992-3161
E-mail: pjago@nrcan.gc.ca

Catriona Armstrong
Industry Officer
Industrial Energy Efficiency
Office of Energy Efficiency
Natural Resources Canada
580 Booth Street, 18th Floor
Ottawa ON K1A 0E4
Tel.: (613) 992-3286
Fax: (613) 992-3161
E-mail: carmstro@nrcan.gc.ca

Jean-Marc Berrouard
Industry Officer
Industrial Energy Efficiency
Office of Energy Efficiency
Natural Resources Canada
580 Booth Street, 18th Floor
Ottawa ON K1A 0E4
Tel.: (613) 943-2224
Fax: (613) 992-3161
E-mail: jberroua@nrcan.gc.ca

Marlene Blakney
Senior Industry Officer
Industrial Energy Efficiency
Office of Energy Efficiency
Natural Resources Canada
580 Booth Street, 18th Floor
Ottawa ON K1A 0E4
Tel.: (613) 996-8278
Fax: (613) 992-3161
E-mail: mblakney@nrcan.gc.ca

Beryl Broomfield
Program Assistant
Industrial Energy Efficiency
Office of Energy Efficiency
Natural Resources Canada
580 Booth Street, 18th Floor
Ottawa ON K1A 0E4
Tel.: (613) 947-4828
Fax: (613) 992-3161
E-mail: bbroomfi@nrcan.gc.ca

Mark Butkus
Writer/Editor, Heads Up CIPEC
Industrial Energy Efficiency
Office of Energy Efficiency
Natural Resources Canada
580 Booth Street, 18th Floor
Ottawa ON K1A 0E4
Tel.: (613) 943-0125
Fax: (613) 992-3161
E-mail: mbutkus@nrcan.gc.ca

Marguerite Dehler
Senior Industry Officer
Industrial Energy Efficiency
Office of Energy Efficiency
Natural Resources Canada
580 Booth Street, 18th Floor
Ottawa ON K1A 0E4
Tel.: (613) 992-1545
Fax: (613) 992-3161
E-mail: madehler@nrcan.gc.ca

Suzanne Forget-Lauzon
Industry Clerk
Industrial Energy Efficiency
Office of Energy Efficiency
Natural Resources Canada
580 Booth Street, 18th Floor
Ottawa ON K1A 0E4
Tel.: (613) 992-3254
Fax: (613) 992-3161
E-mail: sforget-@nrcan.gc.ca

Patricia Lieu
Industry Officer
Industrial Energy Efficiency
Office of Energy Efficiency
Natural Resources Canada
580 Booth Street, 18th Floor
Ottawa ON K1A 0E4
Tel.: (613) 995-3737
Fax: (613) 992-3161
E-mail: plieu@nrcan.gc.ca

Vaughn Munroe
Senior Industry Officer
Industrial Energy Efficiency
Office of Energy Efficiency
Natural Resources Canada
580 Booth Street, 18th Floor
Ottawa ON K1A 0E4
Tel.: (613) 947-1594
Fax: (613) 992-3161
E-mail: vmunroe@nrcan.gc.ca

Kari-Lynn Philipp
Industry Officer
Industrial Energy Efficiency
Office of Energy Efficiency
Natural Resources Canada
580 Booth Street, 18th Floor
Ottawa ON K1A 0E4
Tel.: (613) 943-2361
Fax: (613) 992-3161
E-mail: kphilipp@nrcan.gc.ca

Melanie Phillips
Senior Industry Officer
Industrial Energy Efficiency
Office of Energy Efficiency
Natural Resources Canada
580 Booth Street, 18th Floor
Ottawa ON K1A 0E4
Tel.: (613) 995-3504
Fax: (613) 992-3161
E-mail: mphillip@nrcan.gc.ca

Andrew Powers
Industry Clerk
Industrial Energy Efficiency
Office of Energy Efficiency
Natural Resources Canada
580 Booth Street, 18th Floor
Ottawa ON K1A 0E4
Tel.: (613) 996-5125
Fax: (613) 992-3161
E-mail: apowers@nrcan.gc.ca

Keith Quach
Senior Industry Officer
Industrial Energy Efficiency
Office of Energy Efficiency
Natural Resources Canada
580 Booth Street, 18th Floor
Ottawa ON K1A 0E4
Tel.: (613) 992-3288
Fax: (613) 992-3161
E-mail: kquach@nrcan.gc.ca

Glenda Taylor
Senior Industry Officer
Industrial Energy Efficiency
Office of Energy Efficiency
Natural Resources Canada
580 Booth Street, 18th Floor
Ottawa ON K1A 0E4
Tel.: (613) 992-3422
Fax: (613) 992-3161
E-mail: gtaylor@nrcan.gc.ca

Miranda Williamson
Industry Officer
Industrial Energy Efficiency
Office of Energy Efficiency
Natural Resources Canada
580 Booth Street, 18th Floor
Ottawa ON K1A 0E4
Tel.: (613) 996-7744
Fax: (613) 992-3161
E-mail: miwillia@nrcan.gc.ca

ASSOCIATION MEMBERS

Aerospace Industries Association of Canada

Alberta Food Processors Association

Aluminium Association of Canada

Automotive Parts Manufacturers' Association

Baking Association of Canada

Canadian Association of Manmade Vitreous Fibre Manufacturers

Canadian Association of Petroleum Producers

Canadian Chemical Producers' Association

Canadian Construction Association

Canadian Council of Grocery Distributors

Canadian Electricity Association

Canadian Fertilizer Institute

Canadian Foundry Association

Canadian Gas Association

Canadian Lime Institute

Canadian Manufacturers & Exporters (CME)

– CME Alberta Division

– CME British Columbia Division

– CME Manitoba Division

– CME New Brunswick Division

– CME Newfoundland Division

– CME Nova Scotia Division

– CME Ontario Division

– CME Prince Edward Island Division

Canadian Meat Council

Canadian Petroleum Products Institute

Canadian Plastics Industry Association

Canadian Steel Environmental Committee (Canadian Steel Producers Association)

Canadian Textiles Institute

Canadian Vehicle Manufacturers' Association

Cement Association of Canada

Council of Forest Industries

Electro-Federation Canada

Fisheries Council of Canada

Food and Consumer Products Manufacturers of Canada

Forest Products Association of Canada

Forintek Canada Corporation

Mining Association of Canada

Ontario Food Producers' Association

Packaging Association of Canada

Quebec Forest Industries Association

Small Explorers and Producers Association of Canada

The Rubber Association of Canada

GLOSSARY OF TERMS

Annual Census of Mines
NRCan survey that collects information on SIC 06 and SIC 08.

Annual Survey of Manufacturers (ASM)
Statistics Canada survey. Provides information on the consumption of purchased fuels and electricity (CPFE) for approximately 230 subsectors at four-digit SIC code levels.

Base Year
A reference year. For the Framework Convention on Climate Change, 1990 is the base year.

Canada's Climate Change Voluntary Challenge and Registry Inc. (VCR Inc.)
VCR Inc. is a key element of Canada's National Action Program on Climate Change. It encourages the private and public sectors to take voluntary steps to limit or reduce GHG emissions. As a first step, participants are encouraged to submit a letter of intent confirming a commitment to limit or reduce GHGs from their operations. This is followed by an action plan and subsequent progress reports. The Industrial Energy Innovators program provides a means for manufacturing and mining companies to enrol in VCR Inc.

Carbon Dioxide (CO_2)
A compound of carbon and oxygen that in its normal gaseous state is clear and colourless. CO_2 is formed whenever carbon-bearing fuels are burned. It can also be formed via other reactions not involving combustion.

Economic Energy Intensity
Energy consumption per unit of economic output.

Embodied Energy
The energy consumed to transform all upstream raw materials into the final product; in a life cycle approach, it would be the "cradle to grave" energy burden.

Energy Intensity
Energy consumption per unit of output.

Energy Intensity Indicator
A dimensionless ratio equal to the energy intensity in a particular year divided by the energy intensity of the base year. The energy intensity indicator for the base year equals 1.0.

Energy Performance Measures
Any of a variety of metrics that would indicate an aspect of energy performance

Framework Convention on Climate Change (FCCC)
United Nations convention to address climate change signed by more than 150 countries at the United Nations Conference on Environment and Development in Rio de Janeiro in June 1992. Canada became the eighth country to ratify the Convention, which entered into force on March 21, 1994, thereby committing to work toward stabilizing GHG emissions at 1990 levels by the year 2000.

Greenhouse Gas (GHG)
A GHG absorbs and radiates heat in the lower atmosphere that otherwise would be lost in space. The greenhouse effect is essential for life on this planet since it keeps average global temperatures high enough to support plant and animal growth. The main GHGs are carbon dioxide (CO_2), methane (CH_4), chlorofluorocarbons (CFCs) and nitrous oxides (N_2O). By far the most abundant GHG is CO_2, accounting for 70 percent of the greenhouse effect.

Gross Domestic Product (GDP)
The total value of goods and services produced by the nation's economy before deduction of depreciation charges and other allowances for capital consumption, labour and property located in Canada. It includes the total output of goods and services by private consumers and government, gross private domestic capital investment and net foreign trade. GDP figures are reported in real 1986 dollars.

Higher Heating Value
The amount of heat that is obtained when a specified amount of fuel is combusted with its stoichiometrically correct amount of air, both being at 15°C when combustion starts, and the products of combustion being cooled to 15°C before the heat release is measured (also called gross calorific value or gross heating value).

Industrial Consumption of Energy (ICE) Survey
Statistics Canada survey on energy use. Covers purchased and non-purchased energy for approximately 24 industrial subsectors.

Lower Heating Value
The higher heating value minus the latent heat of vaporization of the water vapour formed by the combustion of any hydrogen present in the fuel. For a fuel with no hydrogen, the higher and lower heating values are the same (also called the lower calorific value or the net heating value).

Natural Resources Canada (NRCan)
The predominant natural resources department of the Government of Canada, NRCan has a mandate to promote the sustainable development and responsible use of Canada's mineral, energy and forestry resources and to develop an understanding of Canada's land mass.

Nitrogen Dioxide (NO_2)
One of a group of gases called nitrogen oxides, which are composed of nitrogen and oxygen. Like sulphur dioxide, nitrogen oxides can react with other chemicals in the atmosphere in the presence of sunlight to form acidic pollutants, including nitric acid

Nitrogen Oxides (NO_x)
The sum of nitric oxide (NO) and nitrogen dioxide (NO_2). Nitrogen oxides react with volatile organic compounds in the presence of sunlight to form ground-level ozone.

Physical Energy Intensity
Energy consumption per unit of physical output

Quarterly Report on Energy Supply and Demand (QRESD)
Provides an energy balance of all energy consumption in Canada. QRESD data on the manufacturing industries are gathered principally by the Industrial Consumption of Energy (ICE) survey. These data are supplemented by other surveys on the disposition of energy (from utilities) and the production of petroleum products

Specific Energy (Consumption)
Energy consumption per physical unit of output (also called physical energy intensity)

Standard Industrial Classification (SIC)
Statistics Canada uses a classification system that categorizes establishments into groups with similar economic activities

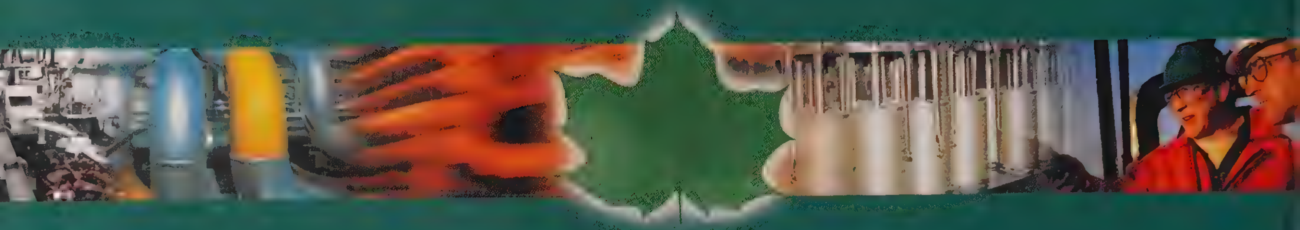
Statistics Canada
Statistics Canada is the country's national statistical agency, with programs organized into three broad subject areas: demographic and social, socio-economic and economic. Under the *Statistics Act*, Statistics Canada is required to collect, compile, analyse, abstract and publish statistical information on virtually every aspect of the nation's society and economy. All information given to Statistics Canada through surveys, the census or any other source is confidential. Statistics Canada does not release any information that identifies an individual or organization.

Tier I
Informal designation by CIPEC of industries that are major energy-consuming industries. The seven designated Tier I industries are pulp and paper, petroleum refining, cement, mining, steel, chemicals and aluminum. The Tier I industries account for approximately 80 percent of total Canadian industrial energy consumption

Tier II
Informal designation by CIPEC of industries that are minor energy-consuming industries (relative to Tier I industries) but contribute substantially to Canadian industrial GDP. Tier II industries account for 60 percent of Canadian industrial GDP

For more information or to receive additional copies of this publication, write to

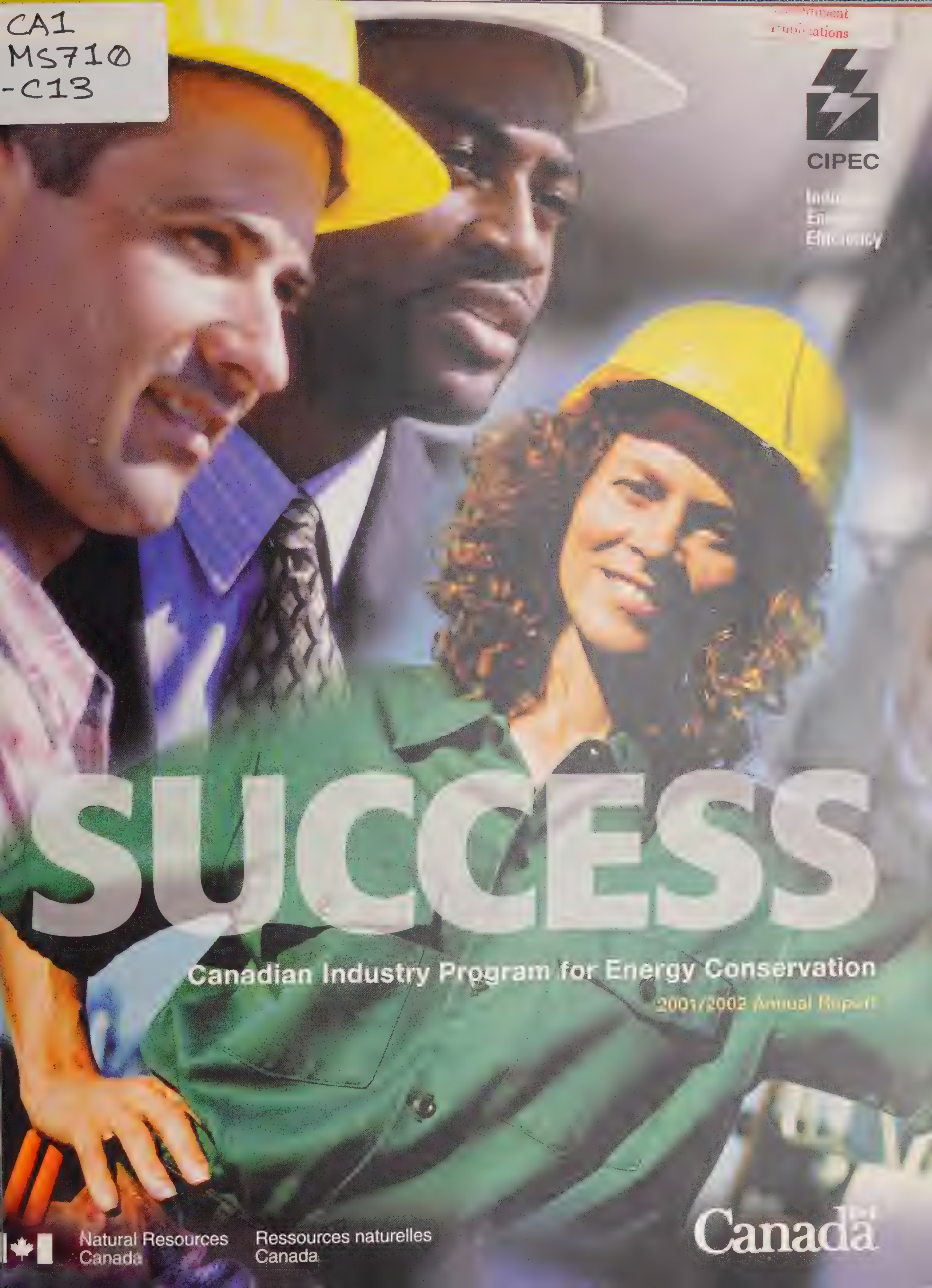
Canadian Industry Program for Energy Conservation
c/o Natural Resources Canada
Office of Energy Efficiency
580 Booth Street, 18th Floor
Ottawa ON K1A 0E4
Tel.: (613) 995-6839
Fax: (613) 947-4121
E-mail: cipec.peeic@nrcan.gc.ca
Web site: http://oee.nrcan.gc.ca/cipec



The Office of Energy Efficiency of Natural Resources Canada strengthens and expands Canada's commitment to energy efficiency in order to help address the challenges of climate change.

Leading Canadians to Energy Efficiency at Home, at Work and on the Road

Canada



CIPEC

SUCCESS

Canadian Industry Program for Energy Conservation

2001/2002 Annual Report

Natural Resources Canada | Ressources naturelles Canada

Canada

The National Library of Canada has catalogued this publication as follows:

2001/2002 ANNUAL REPORT

Success Stories

Sector Reports

OUR MISSION

To promote effective voluntary action that reduces industrial energy use per unit of production, thereby improving economic performance while participating in meeting Canada's climate change objectives.

The following companies exhibit the vision and perspective that symbolize CIPEC's mission.

BHP Billiton Diamonds Inc.'s recently formed "Operating Excellence" team at its Ekati Diamond Mine™ in the Northwest Territories has invigorated the company's energy efficiency efforts. Because all fuel used at the mine must be trucked in, minimizing energy consumption is vital to the mine's economic viability.

Operating Excellence

at Northwest Territories diamond mine

Although the mine is energy efficient by design and the company has an eight-year record of investing in energy savings, Operating Excellence has taken earlier efforts to a new level by instilling a relentless commitment to seizing every available opportunity to reduce waste.

The Operating Excellence team, formed in April 2002, is made up of a small group of passionate volunteers from a number of departments. Their goal is to save 500 000 litres of fuel per year – about 6 percent of the mine's annual consumption. Seeking to build an energy-saving culture within the company, the team introduced a suggestion program that garnered overwhelming response. Reinforced by an energy awareness program that includes prizes and recognition, the mine began installing motion-sensor lighting and educating staff to turn out lights in unoccupied areas. Thanks to the suggestions it received as well as its own ideas, within three weeks of its launch, the Operating Excellence team cut fuel usage by an impressive 88 000 litres per year.

Operating Excellence continues to look at all corners of the mine's operations for additional energy savings. For example, the team is investigating the possibility of replacing diesel fuel with used oil in its waste incinerators, potentially saving as much as 475 000 litres of fuel per year. With a great deal of energy needed to pump potable water at the mine, the team is also looking at cutting electricity consumption by improving the efficiency of water-handling equipment, including devices as small as toilets and sinks.

With its annual eight-week window of opportunity to haul 90 million litres of fuel oil northward on a winter road that is open only from late January to late March, BHP Billiton Diamonds Inc. is concerned more with fuel savings than dollar savings.

Like most of The Clorox Company of Canada, Ltd.'s manufacturing operations, the Glad Division plant in Orangeville, Ontario, has been actively seeking ways to improve its energy efficiency.

Community action

preserves an efficient transportation option

In recent years, the plant has installed high-efficiency lighting systems and motion-sensor-activated lights, wrapped its extruder manifolds with insulating blankets and retrofitted its switch gears with capacitors – all in aid of conserving energy. However, it is the company's participation in the preservation and operation of a railway line that has attracted the most attention.

Spearheading a consortium of six local companies, Clorox played a vital role in acquiring the mothballed 55-kilometre Canadian Pacific Railway line between Orangeville and Streetsville, Ontario, and creating a company to operate it. The consortium, called the Orangeville-Brampton Rail Access Group (OBRAG), convinced provincial, county and local governments to purchase the line and took on responsibility for maintenance, capital improvement and administration. OBRAG hired Cando Contracting Ltd., a specialist in running short-haul railways, to operate the rolling stock.

Beginning operations in November 2000, the rail line now provides a vital link between local manufacturers and their supply chains, carrying about 500 freight-car loads of raw materials to Orangeville each year. Although the driving force behind the preservation of the rail line was an economic one, OBRAG estimates that its trains save a significant amount of fossil fuel consumption by replacing about 1400 annual truck trips from the Greater Toronto Area over local roads. Supplanting these stop-and-go truck trips with a non-stop train route is definitely a step in the right direction for air quality and reduced GHG emissions.

The "Pride of Orangeville" hauls raw materials twice weekly to seven manufacturers in Ontario. Five are in Orangeville, including the Glad Division plant, and two are in Brampton.

The environmental principles under which General Motors of Canada Limited (GMCL) operates demonstrate the company's resolve to "reach further than compliance with the law to encompass the integration of sound environmental practices into our business decisions."

Persistence

pays off in energy savings for General Motors of Canada Limited

The company's persistence in fulfilling this mandate has led to impressive results in many areas, including GHG emissions reductions. Over the last decade, a far-reaching program of initiatives launched by GMCL has reduced its company-wide GHG emissions by 37 percent since 1990, in the process reducing its energy use by 479 million kWh. Energy efficiency efforts undertaken by the company at its vehicle assembly plants have reduced energy consumption per vehicle produced from 3.43 MWh in 1990 to 2.44 MWh in 2000, a decrease of 30 percent. Over the same period, GMCL realized a similar per-vehicle reduction in GHGs, from 0.652 tonnes of carbon dioxide equivalent (CO_2e) in 1990 to 0.458 tonnes in 2000.

GMCL has achieved these results through a rationalization of production and by investing in energy-efficient equipment and manufacturing processes. The company also actively informs employees and suppliers and motivates them to commit to energy efficiency in their operations. In addition, GMCL participates in such organizations as the Coalition for Environmentally Responsible Economies (CERES), which brings together environmental, investor and advocacy groups to focus on creating sustainable and socially responsible practices. GMCL is working toward an aggressive new environmental target – a 25 percent reduction in energy usage with a baseline year of 1995 by the year 2005. This would result in a projected CO_2 reduction of about 45 percent compared with a 1990 baseline.

A non-production load improvement project at General Motors of Canada Limited's site in Oshawa, Ontario, has resulted in annual energy savings of more than [illegible] million kWh.

Fuelled by natural gas, the fluosolids dryer at IMC Potash Colonsay operates around the clock, 330 days a year. Drying fluosolids is an energy intensive activity, and any improvements in the process are likely to pay significant dividends in reduced energy costs at this potash mill in Colonsay, Saskatchewan.

Innovation

enables potash producer to cut process fuel consumption

The company established a project team to evaluate energy consumption in the dryer, identify the most promising possibilities for process improvement and implement these solutions. The team found that gaining better control of airflow in the dryer's windbox (thereby holding temperatures at optimum levels) offered major opportunities for a reduction in energy consumption. However, lacking adequate airflow data that would enable it to identify optimum variables for the complex equipment, the team was forced to improvise using "design of experiment" techniques. Getting it right was critical, as any mistakes would show up as a deterioration in product quality.

Using a variety of systems, technologies, practices and programs, the project team developed a solution that works for various production levels. The mill's digital control system was modified with an algorithm that mimics the response of a control operator to process changes, instantly adjusting airflow to maintain optimum drying temperatures. The project's results speak for themselves – by improving dryer fuel efficiency by 11 percent, the mill has reduced annual natural gas consumption at the Colonsay site by 1.4 million m^3 and cut electricity use by reducing the workload on windbox fans. The company estimates that the $10,000 project will save the mill $490,000 per year, results that can be tripled by duplicating the solution at two other company mills.

As part of a worldwide family of quality-oriented companies, Michelin North America (Canada) Inc. is committed to a simple energy management goal: to manufacture more product with less energy.

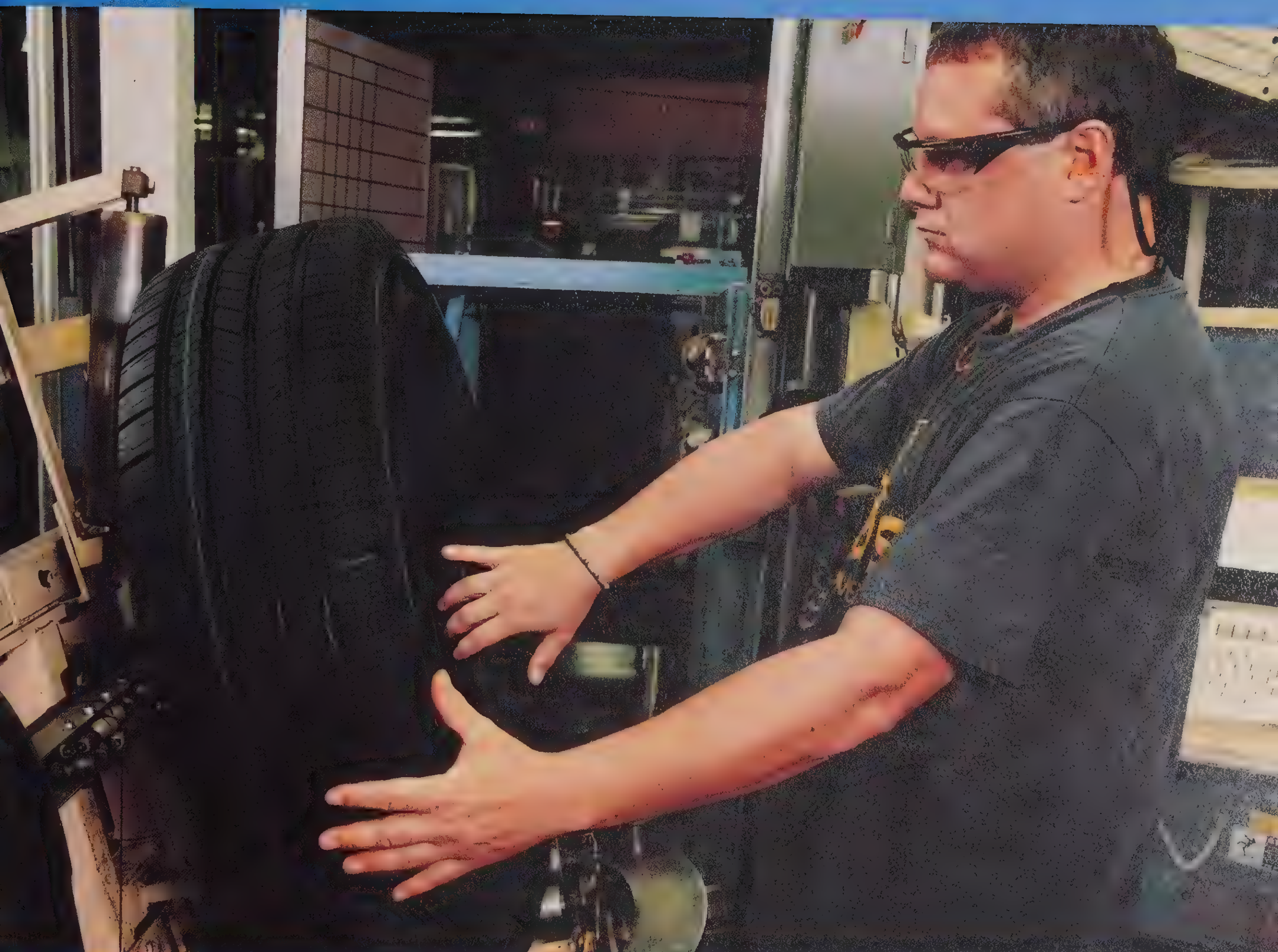
Sharing best practices

across North America drives results for Michelin

Making this happen has led the company to work closely with Michelin operations in the United States, establish and share best practices, and develop an ongoing energy training program for employees in its three tire plants in Nova Scotia. It has also provided the impetus to upgrade technology and implement practices for operations and maintenance that are more energy efficient.

Michelin has appointed an energy champion at each plant who works to ensure that energy efficiency considerations are integrated into the decision-making process and incorporated into the plant's working culture. Within its plants, power monitoring systems identify areas of prime electricity usage – the first step in developing ways to improve electrical efficiency. Ongoing audits of steam and compressed-air handling systems enable plants to identify areas that need improvement and to implement maintenance procedures that ensure that steam and air leaks are located and repaired immediately.

Investments in new technology are also yielding results. The company installed variable speed drives on four major handling units in one of its plants (an investment that paid for itself in less than one year through energy savings) and upgraded lighting to more efficient T-8 fluorescent technology. Thanks to concerted efforts to upgrade energy efficiency, Michelin's energy intensity trends have shown a strong improvement. Depending on the product line, the company's Canadian plants have reduced the energy consumed per kilogram of production by between 10 and 25 percent since 1992.



Michelin North America (Canada) Inc. has improved the energy efficiency of its systems for refrigeration, compressed air, motor drives and HVAC at its three facilities in Nova Scotia.

When Nestlé Canada Inc. asked its factories to commit to a 5 percent reduction in energy use for the year 2000, Midwest Food Products Inc.'s plant in Carberry, Manitoba, responded.

Exceeding targets

drives energy efficiency at Nestlé subsidiary

The producer of frozen and dehydrated potato products took a hard look at its processes and identified a number of areas where energy usage performance could be improved. For example, the plant decided to upgrade its electrical system and retrofit its line dryers to improve energy efficiency. Midwest Food Products also installed more efficient automatic pressure-venting equipment on its steam system as part of a program to minimize vented steam, thereby reducing energy waste.

The results of these and the plant's other energy initiatives are impressive. These initiatives represent a reduction in energy costs of more than $900,000 in 1999 and $400,000 in 2000 for the Carberry plant. As a result of its aggressive actions to reduce wasted energy, between 1997 and 2000 Midwest Food Products slashed CO_2 emissions that result from the consumption of fuels in its processing plant by about 10 000 tonnes per year, making a significant contribution to Canada's GHG-reduction initiatives.

Nestlé Canada Inc. is also concerned about the environmental impacts of its factories, and in 2000 the head office undertook a company-wide water-usage reduction program with an identified target of a 5 percent reduction per year. Midwest Food Products has exceeded this target by reducing its water usage by 15 percent in one year.

The factories of Nestlé Canada Inc., which include Midwest Food Products Inc., support economically sound industry initiatives that are designed to voluntarily assist the Government of Canada in meeting its goal of reducing greenhouse gas emissions.

Finding simple, low-cost opportunities to capture waste energy is leading to significant GHG reductions for petroleum and natural gas producer Nexen Inc.

Imagination

yields big GHG reductions for oil producer Nexen Inc.

Over the past five years, Nexen has employed this strategy to achieve significant energy waste reductions in its heavy oil operations.

As part of its road map to GHG reduction, Nexen installed portable vent gas compressors and gathering systems at various locations throughout its operations to capture previously vented natural gas, thereby conserving 5.8 million standard cubic feet per day (mmscfpd) of methane and reducing GHG emissions by the equivalent of more than 700 kilotonnes of CO_2 per year. At its facility in Luseland, Saskatchewan, the company now uses captured gas to fuel production equipment, saving the equivalent of 1 mmscfpd in energy consumption and reducing emissions by 150 000 tonnes of CO_2e per year.

With its road map to reduced GHGs also pointing the way to an improved bottom line, Nexen is studying other profitable opportunities to save waste energy. The company is exploring the capture and compression of casing gas for injection into its gas wells, providing an energy reserve for future use as vent rates decline and energy demand increases. Nexen is also looking at the use of casing gas collected in the field for processing and sale to generate power for use in the oil field or to fuel its nearby processing facilities. Whichever road it follows, the company is certain that the imagination and dedication of its operations staff can overcome any detours or roadblocks along the way.

Nexen Inc.'s facility in Luseland, Saskatchewan,

and its other heavy-oil operating areas have shown impressive results through methane vent reductions.

Nexen is challenging other producers to find similar benefits in other oil and gas operations.

Ontario Power Generation Inc. (OPG) is serious about improving energy efficiency and reducing GHG emissions. In recent years, the company has incorporated these twin objectives into its management systems, launched a series of major energy-saving activities and joined with other organizations to further a proactive environmental agenda.

Partnerships work!

Ontario Power Generation program recognized as North American leader

OPG's actions are part of a comprehensive initiative called "Energy Efficiency @ Work," an award-winning program that combines employee education, cooperative action, energy-related investment and the search for alternative "green" sources of electrical energy.

The Energy Efficiency @ Work program has yielded dramatic results. Since 1994, the company has undertaken more than 300 thermal/conversion efficiency and electrical efficiency projects, leading to energy savings of 2000 GWh per year, annual cost savings of $90 million and yearly GHG emissions reductions of 2.7 million tonnes. The company's energy savings under the program are equivalent to the energy consumed by a city of 80 000 people every year.

Networking and sharing information and advice helped to make the Energy Efficiency @ Work program a success. The program is a result of many contributions and special partnerships that OPG developed with the Canadian Energy Efficiency Alliance, Natural Resources Canada's Office of Energy Efficiency and support from the Alliance to Save Energy and Consortium for Energy Efficiency. Together, these organizations have demonstrated that energy efficiency makes sense and can be accelerated through partnerships.

Committed to cooperative action on climate change, OPG's Energy Efficiency @ Work program was the first Canadian endeavour to win the prestigious Climate Protection Award presented by the U.S. Environmental Protection Agency. These achievements amply demonstrate OPG's commitment to maintaining its triple bottom line of economic performance coupled with environmental stewardship and social equity.

Ontario Power Generation Inc., in partnership with Enbridge Gas Distribution Inc., EnerSys Analytics Inc., Internorth Construction Ltd. and NRCan's Commercial Building Incentive Program, achieved a 58 percent energy improvement over Canada's *Model National Energy Code for Buildings* for OPG's 777 Brock Road Building in Pickering, Ontario. More information is available at the Web site at http://www.energy-efficiency.com.

An energy audit at Schneider Foods' plant in Kitchener, Ontario, has uncovered major opportunities for energy and cost savings.

Incentives

drive productive energy audits at Schneider Foods

The audit, conducted with the help of the Government of Canada's Industrial Energy Audit Incentive, focussed on the company's steam and refrigeration systems and on opportunities for energy cogeneration. By taking a thorough look at Schneider Foods' facility, equipment and operating systems, the audit uncovered hundreds of thousands of dollars in potential savings – savings that are also possible at other Schneider plants.

For example, modifications to the boiler plant feeding the plant's steam systems could save $145,000 in yearly natural gas expenditures, and reductions in the main plant's ventilation rate can save another $125,000. Together, these measures would reduce the plant's natural gas consumption by about 20 percent, with a payback on investment of less than one year. Improvements to refrigeration and ventilation systems could reduce electricity use by 15 percent and produce savings of $465,000 per year. Several of the measures recommended by the audit, such as reductions in steam pressures and in the ammonia cooling process, can be implemented at no cost, thereby producing instant savings with no impact on temperatures or product quality.

The audit identified cogeneration as one of the most promising energy-saving opportunities for Schneider Foods. The plant's electrical and steam usage profile is ideal for on-site power generation, and an investment of $6 million to install a natural-gas-powered generating system should net the company about $1.5 million in annual energy savings.


SCHNEIDERS

Compared with most plants in the Stelco family, the Stelfil Ltée facility in Lachine, Quebec, is small. But small manufacturing plants that focus on energy efficiency can have a big impact.

Conversion

from propane to natural gas yields environmental benefits for Stelfil Ltée

Since 1991, by diligently looking at equipment, maintenance and operating practices for ways to improve efficiency, Stelfil achieved a 30 percent reduction in energy consumption.

The plant left no stone unturned. For example, the steel wire producer recognized an opportunity to reduce its GHG emissions by converting its heavily used fleet of lift trucks to natural gas. Stelfil installed two 3600-psi natural gas compressors and refitted its 24 lift trucks to handle the new fuel. The results have been outstanding – not only was the annual consumption of 240 000 litres of propane replaced by 145 000 m^3 of less expensive natural gas, but the cleaner-burning fuel saved an additional 225 000 m^3 of natural gas each year by reducing ventilation requirements. In total, Stelfil's lift truck program reduced the plant's GHG emissions by 489 tonnes of CO_2.

And there were other benefits. Employee safety improved because using natural gas substantially reduced carbon monoxide emissions within the plant, the danger of explosion was minimized and back injuries resulting from cylinder replacements were eliminated. Moreover, lift truck engine maintenance costs were cut, refuelling time was halved and energy costs were slashed by more than $100,000 per year.

Stelfil Ltée's employee awareness programs and its continued search for new technologies will allow it to further reduce its energy consumption in the coming years.

St. Lawrence Cement Inc. reduces the energy component of its cement products by substituting supplementary cementitious materials (SCMs) for Portland cement and recovering energy from selected waste materials.

Substitution

with waste materials a key to energy-efficient cement production

The company is a joint owner – with St. Marys Cement – of Great Lakes Slag, which granulates blast furnace slag, a by-product of steel making. St. Lawrence Cement grinds the granulated slag at its plant in Mississauga, Ontario, to produce GranCem®, an SCM that can reduce the use of energy-intensive Portland cement in the production of concrete. Ready mix companies blend GranCem® with Portland cement to make concrete for the construction of foundations and highways. The appropriate use of GranCem® indeed brings improved performance in mechanical properties and durability to concrete.

GranCem®, which is used in a mixture with cement in a ratio of 1 to 3 or 1 to 4, consumes about 25 percent of the energy needed to manufacture the Portland cement that it replaces. By investing in GranCem® production, St. Lawrence Cement is able to accommodate much of its market growth without corresponding increases in energy consumption.

St. Lawrence Cement is also using waste materials to substitute part of the energy component in cement. The company has installed a $6 million granular fuel system at its facility in Joliette, Quebec, that will allow the plant to burn waste material such as sawdust, tire fluff, rubber chips and dried sewage sludge in two of its four kilns. The new system will enable the company to offset the burning of about 42 000 tonnes of coal and coke fuel per year by co-processing waste material that would otherwise have been landfilled or disposed of in a less beneficial manner.

Cement manufacturing is highly energy intensive. St. Lawrence Cement has concentrated significant efforts on improving energy efficiency in recent decades.

Thanks in part to its active involvement in workshops conducted by Natural Resources Canada's Office of Energy Efficiency under the CIPEC banner, Versacold Group has made outstanding progress toward improved energy efficiency.

Participation

in "Dollars to $ense" workshops pays off for Versacold Group

Across the company, Versacold facilities reduced energy costs in 2001 despite rapid increases in natural gas prices, the inclusion of an additional site in the company's calculations and a doubling of electricity prices in Alberta due to deregulation. Compared with its energy use in 2000, the company decreased its use of electricity by 1.2 million kWh (1 percent) and its use of natural gas by 12 800 GJ (7 percent).

Innovation and cooperation are among the tools Versacold uses locally to further its company-wide energy efficiency goals. For example, at its facility in Lethbridge, Alberta, the company is recovering waste heat from the industrial refrigeration plant and using it to preheat process feed water for Maple Leaf Potatoes, which shares the same building. In 2001, the heat recovery program's first full year of operation, Versacold transferred an average of 1.42 million Btu per hour of waste heat from its cooling facilities to the potato plant's feed water. Over the course of the year, the facility reduced natural gas consumption by 11 percent, saving more than $87,000 in expenditures for natural gas. When electricity savings are added, the $105,000 project paid for itself in less than a year.

Versacold Group rewards the outstanding efforts of its energy managers with its own annual energy efficiency awards. These are presented to each of the company's Pacific, Alberta and Eastern regions. A national award is also given. Two of these awards were presented at Versacold's energy managers' conference in Vancouver, British Columbia, in 2002.


PARTNERSHIP IN A
NEW ERA

This report represents a watershed for the Canadian Industry Program for Energy Conservation (CIPEC). For the first time, it reflects the completion of our expansion beyond our original mining and manufacturing mandate to encompass the energy management efforts of substantially all Canadian industry.

CIPEC, a remarkable partnership between Canadian business and the Government of Canada, is now the true standard-bearer for industrial energy efficiency action across the country.

The transition to this expanded role was completed with the addition of three new sectors to the CIPEC family. In last year's Annual Report, the energy supply sector, represented by electricity generation and upstream oil and gas, reported for the first time. This year, the construction sector joins the fold.

With industry more unified under the CIPEC umbrella, the organization now brings together sectoral associations that encompass well over 95 percent of all industrial energy use in Canada. Broader, stronger and more active than ever in our efforts to promote effective energy management, the program continues to set new standards for organizations of its type throughout the world.

CONTINUOUS IMPROVEMENT: A SNAPSHOT

MINING, MANUFACTURING AND CONSTRUCTION

- These sectors achieved an energy intensity improvement of 1.8 percent per year between 1990 and 2001, well above the 1 percent-per-annum improvement commitment made in 1994.
- Energy-related greenhouse gas (GHG) emissions in 2001 were 8.4 percent lower than emissions in 1990.
- According to Natural Resources Canada (NRCan) statistics, these sectors used 22.5 percent less energy to produce a dollar of output in 2001 than they did in 1990.

ENERGY SUPPLY

- Upstream oil and gas companies have implemented 307 projects that have resulted in GHG reductions of 13 million tonnes.
- Electric utilities reported 706.3 GWh of alternative energy production in 2001, up from 0.4 GWh in 1990.

CANADIAN INDUSTRY: THE BIG PICTURE

- The average annual energy intensity improvement from 1990 to 2001 was 0.5 percent.
- The total energy saved by CIPEC industries during 2001 is equivalent to 93 percent of consumer energy demand in the Atlantic provinces.
- Energy savings related to effective energy management practices totalled more than $2.8 billion in 2001.
- CIPEC sectors used 5.6 percent less energy to produce a dollar of output in 2001 than they did in 1990.
- Two new trade associations signed letters of cooperation with CIPEC, bringing total participation to 45 associations. Collectively, these groups represent more than 5000 companies – more than 95 percent of industrial energy demand.
- There are now 25 CIPEC task forces, covering almost every aspect of industrial energy demand in Canada.
- By the end of 2002, 374 companies were registered as Industrial Energy Innovators, an increase of 60 companies over the previous year. The eagerness of Canadian companies to sign up for this program is a sure sign that they are more aware than ever that sound energy management is key to business success and to their ability to take advantage of new programs.

CIPEC continues to grow because companies recognize two facts about energy efficiency: it's good for business and it benefits the environment. Today, with volatile and generally rising energy prices and international climate change initiatives that are prompting businesses to look closely at how they use energy, CIPEC and the resources it offers have never been more relevant. By providing tools to improve energy efficiency, CIPEC is helping participants cut costs and increase profits. Combined on a national scale, these actions are playing a significant role in reducing Canada's energy consumption and GHG emissions – essential progress toward meeting our international climate change commitments.

SUSTAINING CIPEC'S MOMENTUM

When Canada signed the Kyoto Protocol, its national climate change mandate advanced to a new level. The challenge now facing CIPEC is to match the accelerated pace of change required of business with the innovative support programs and powerful energy management tools needed to foster success.

With the vast majority of Canadian industry now covered by CIPEC, our goal is to help industry – sector by sector and company by company – to sustain and intensify the march toward effective energy management. CIPEC's mission remains fundamentally the same: to promote, encourage and foster energy efficiency improvements and GHG emissions reduction throughout Canada's industrial sectors.

CIPEC believes that the tools and resources that it makes available to participating sectors will take on greater importance as companies seek out every opportunity to improve economic performance and lower GHG emissions. CIPEC's customized workshops can help companies audit their energy consumption, identify waste, establish energy management systems and implement actions that improve efficiency.

As the pace toward GHG emissions reductions quickens, CIPEC will respond by continuing to play a key role as a conduit for vital information on government programs and funding opportunities and to develop programs and services that respond to the evolving needs of Canadian industry.

A NEW ENERGY NETWORK

One of CIPEC's most significant recent initiatives is its Energy Managers Network. The goal of this group is to develop a learning network for industrial energy practitioners who seek to share the knowledge, information, tools and skills required to improve the competitiveness of their organizations and support climate change goals.

The CIPEC Energy Managers Network is based on the belief that achieving improvement in industrial energy efficiency requires ever-broadening participation from industry. The Network is supported by a Web site that provides access to a comprehensive energy management tool kit, training resources, workshops and the CIPEC Energy Managers Network Discussion Board.

AN IMPORTANT RESOURCE

In 2002, NRCan conducted a study to determine the effectiveness of the CIPEC program. The results affirmed the importance of CIPEC to improving energy efficiency and reducing GHG emissions in Canada. According to the study, there was a significant difference between the amount of energy consumed by CIPEC participants and by non-participants. The results demonstrated that

- the growth of energy consumption by participants was less than half of that for non-participants
- three times more participants reported reductions in energy use than non-participants
- 15 percent fewer participants reported an increase in energy use than non-participants

The study also revealed that individual CIPEC programs are well received, with 100 percent of participants using at least one program element. Results show that

- 60 percent of participants read our regular newsletter *Heads Up CIPEC*
- 45 percent use the CIPEC Web site
- 42 percent participate in CIPEC workshops

Of participants attending a CIPEC "Dollars to $ense" workshop, more than half implement energy efficiency elements such as conducting energy inventories, developing motor-loading profiles and establishing an energy management team.

THE ROAD AHEAD

In the coming year, CIPEC's goal is to broaden its mandate and augment its services to help industry comply with increasingly demanding standards of emissions performance. The stakes are high for Canada and for the industries that power our economy. CIPEC is ready to play a vital role in building and sustaining the momentum toward positive change.

On behalf of the CIPEC family of industries, I would like to express our gratitude to NRCan for its continued and growing support of CIPEC's unique public and private sector partnership. The task ahead is demanding, but with government and industry working together, I am confident that Canada will continue to make strong progress toward its climate change goals.

Douglas E. Speers
President and CEO, EMCO Limited
Chair, CIPEC Executive Board

New CIPEC Chair

Douglas E. Speers has been named Chair of CIPEC's Executive Board. He replaces W. Warren Holmes, Senior Vice-President, Canadian Mining Operations, Falconbridge Ltd., who served as Chair from 2000 to 2002. A professional engineer with extensive experience in the petroleum industry, Mr. Speers is President and CEO of EMCO Limited, a leading Canadian building products company. Under his leadership, EMCO has moved to the forefront in the pursuit of energy efficiency. His commitment to CIPEC's goals and his track record of service in other voluntary roles in manufacturing, construction and education make Mr. Speers an ideal choice to guide the new CIPEC.

CIPEC Executive Board

Douglas E. Speers
President and Chief Executive Officer
EMCO Limited
620 Richmond Street
London ON N6A 5J9
Tel.: (519) 645-3900
Fax: (519) 645-2465
E-mail: dspeers@emcoltd.com

Peter Birnie
President
Wabi Iron & Steel Corporation
330 Broadwood Avenue
P.O. Box 1510
New Liskeard ON P0J 1P0
Tel.: (705) 647-4383
Fax: (705) 647-6954
E-mail: pbirnie@wabicorp.com

Peter H. Cooke
Senior Consultant
Lafarge Canada Inc.
606 Cathcart Street, 8th Floor
Montréal QC H3B 1L7
Tel.: (514) 861-1411, Ext. 3285
E-mail: peter.cooke@lafarge-na.com

T. Reginald Driscoll
President
Albarrie Canada Limited
85 Morrow Road
Barrie ON L4N 3V7
Tel.: (705) 737-0551
Fax: (705) 737-4044
E-mail: albarrie@albarrie.com

James Fleck
President and CEO
Camco Inc.
175 Longwoods Road South
Hamilton ON L8N 3Y5
Tel.: (905) 521-3106/
(905) 521-3128 (Carollyn Wilkins)
Fax: (905) 521-3386
E-mail: carollyn.wilkins@camc.ge.com

Daniel Gagnier
Vice-President
General and Environmental Affairs,
Health and Safety
Alcan Inc.
1188 Sherbrooke Street West
Montréal QC H3A 3G2
Tel.: (514) 848-8118
Fax: (514) 848-1494
E-mail: daniel.gagnier@alcan.com

Wayne Kenefick
Director of Sustainable Development
Graymont Limited
3025 – 12th Street North East, Suite 190
Calgary AB T2E 7J2
Tel.: (403) 219-1320
Fax: (403) 291-1303
E-mail: wkenefick@graymont-ab.com

Hugh Klaassen
Corporate Operating Officer
Paramount Resources Ltd.
4700 Bankers Hall West
888 – 3rd Street, S.W.
Calgary AB T2P 5C5
Tel.: (403) 290-3671
Fax: (403) 290-3614
E-mail: hugh.klaassen@paramountres.com

Yves Leroux
Vice-President Regulatory & Government Affairs
Parmalat Dairy & Bakery Inc.
405 The West Mall
Toronto ON M9C 5J1
Tel.: (416) 620-3010
Fax: (416) 620-3538
E-mail: yves_leroux@parmalat.ca

David Lewin
Senior Vice-President
EPCOR
10065 Jasper Avenue
Edmonton AB T5J 3B1
Tel.: (780) 412-3196
Fax: (780) 412-3192
E-mail: dlewin@epcor.ca

J. Norman Lockington
Vice-President, Technology
Dofasco Inc.
1330 Burlington Street East
P.O. Box 2460
Hamilton ON L8N 3J5
Tel.: (905) 548-7200, Ext. 3422
Fax: (905) 548-4667
E-mail: norm_lockington@dofasco.ca

Kevin Lyden
President
UPM-Kymmene Inc.
999 Oakmont Plaza Drive
Westmont IL 60559
U.S.A.
Tel.: (630) 850-4932
Fax: (630) 850-3511
E-mail: carolee.rabjohns@upm-kymmene.com

Brenda MacDonald
President
Coyle & Greer Awards Canada Ltd.
4819 Mossley Drive
P.O. Box 247
Mossley ON N0L 1V0
Tel.: (519) 269-3000, Ext. 233
Fax: (519) 269-3038
E-mail: bmacdonald@coylegreer.com

C.A. (Chris) Micek
Environment Manager Canada
Agrium Inc.
11751 River Road
Fort Saskatchewan AB T8L 4J1
Tel.: (780) 998-6959
Fax: (780) 998-6677
E-mail: cmicek@agrium.com

Geoffrey H. Moore
President
Fibrex Insulations Inc.
561 Scott Road
P.O. Box. 2079
Sarnia ON N7T 7L4
Tel.: (519) 336-7770, Ext. 232
Fax: (519) 336-1634
E-mail: gmoore@fibrex.org

Ronald C. Morrison
Treasurer of the Board
Canadian Manufacturers & Exporters
1377 Hazelton Boulevard
Burlington ON L7P 4V2
Tel.: (905) 464-5887
Fax: (905) 335-0523
E-mail: rcm161@aol.com

John D. Redfern
Chairman of the Board
Lafarge Canada Inc.
606 Cathcart Street, 8th Floor
Montréal QC H3B 1L7
Tel.: (514) 861-1411, Ext. 3202
Fax: (514) 876-8900
E-mail: john.redfern@lafarge.ca

Andrew Stephens
Vice-President
Refining and Supply
Petro-Canada
2489 North Sheridan Way
Mississauga ON L5K 1A8
Tel.: (905) 804-4565
Fax: (905) 804-4644
E-mail: stephens@petro-canada.ca

Norman J. Stewart
Vice President, Government Relations
& General Counsel
Ford Motor Company of Canada, Limited
The Canadian Road
P.O. Box 2000
Oakville ON L6J 5E4
Tel.: (905) 845-2511, Ext. 1104
Fax: (905) 845-5759
E-mail: nstewart@ford.com

HOW CIPEC WORKS

CIPEC is an umbrella organization overseeing a partnership between government and private industry aimed at improving Canada's industrial energy efficiency. CIPEC comprises sectoral task forces, each of which represents companies engaged in similar industrial activities that participate through their trade associations. The Task Force Council, with representatives from each CIPEC sector, provides a common forum for sectors to share ideas and recommend ways to address common needs. Overall direction is provided by an Executive Board, which is made up of private sector leaders who are committed to industrial energy efficiency.

In the CIPEC partnership, change emerges from consensus and joint action built through open and honest communication. CIPEC continues to be the focal point for industry's response to Canada's climate change efforts. Our role is to promote the evolution of energy efficiency and to identify and reward those who lead the way.

We carry out this mandate in part through a strong communications and awareness program anchored in our twice-monthly *Heads Up CIPEC* newsletter and in regular features in selected trade magazines. In July 2002, *Heads Up CIPEC* was redesigned as an on-line newsletter. This technological transformation has helped to increase traffic on the CIPEC Web site from 32 000 hits per month to more than a quarter of a million.

CIPEC also raises awareness of the goals and benefits of improved energy use in other ways. The Task Force Council and individual sectors are constantly at work to broaden participation, encourage the sharing of information and bolster awareness of the role and achievements of CIPEC industries.

CIPEC volunteers include successful business leaders and others recognized on the national stage. The profile of these leaders and their strong belief in CIPEC's principles give us a strong edge in attracting new industry participants and in continuing the successful partnership between industry and government.

THE EVOLUTION OF CIPEC DATA

For the first time, CIPEC sectors in this report are organized in accordance with the North American Industry Classification System (NAICS). NAICS replaces the Standard Industrial Classification (SIC) system used in previous years. The switch was made to bring Canada's classification system in line with Mexico and the United States and its partners in the North American Free Trade Agreement and involved sub-sector realignment. In addition, the GDP dollar values reported here have been updated to reflect a 1997 base year. Previous reports were based on a 1986 base year.

Accurate measurement and meaningful data are fundamental to measuring energy efficiency improvements. The data used in this report are collected by Statistics Canada and interpreted by the Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC) at Simon Fraser University in Burnaby, British Columbia. From Statistics Canada data, CIEEDAC produces energy intensity indicators for each sector based on production and GDP.

The cooperative CIEEDAC system is internationally recognized for its methodologies, data integrity and cooperation with CIPEC. Primary funding for CIEEDAC comes from NRCan, with additional contributions from industry associations that participate in CIPEC and from the province of Quebec.

CIPEC Task Force Council

CIPEC Task Force Council Chair
Susan Olynyk
Senior Energy Specialist
Dofasco Inc.
1330 Burlington Street
P.O. Box 2460
Hamilton ON L8N 3J5
Tel.: 1 800 363-2726, Ext. 6107
Fax: (905) 548-4267
E-mail: susan_olynyk@dofasco.ca

Aluminum Sector Task Force
Christian Van Houtte
President
Aluminium Association of Canada
1010 Sherbrooke West, Suite 1600
Montréal QC H3A 2R7
Tel.: (514) 288-4842
Fax: (514) 288-0944
E-mail: associa@aluminium.qc.ca

Brewers Sector Task Force
Margo Dewar
Vice-President, Economic Policy and Programs
Brewers Association of Canada
100 Queen Street, Suite 650
Ottawa ON K1P 1J9
Tel.: (613) 232-9601
Fax: (613) 232-2283
E-mail: mdewar@brewers.ca

Cement Sector Task Force
Christian Douvre
Vice-President, Performance and Technical Assistance
Lafarge North America
6150 Royalmount Avenue
Montréal QC H4P 2R3
Tel.: (514) 738-3565
Fax: (514) 738-1124
E-mail: Christian.Douvre@lafarge-na.com

Chemical Sector Task Force
David F. Podruzny
Senior Project Manager
Business & Development
Canadian Chemical Producers' Association
350 Sparks Street, Suite 805
Ottawa ON K1R 7S8
Tel.: (613) 237-6215
Fax: (613) 237-4061
E-mail: dpodruzny@ccpa.ca

CIPEC Annual Report
Bob Clapp
Vice-President, Ontario Division
Canadian Petroleum Products Institute
20 Adelaide Street East, Suite 901
Toronto ON M5C 2T6
Tel.: (416) 492-5677, Ext. 33
Fax: (416) 492-2514
E-mail: bobclapp@cppi.ca

CIPEC Communications Committee
Ed Gregory
Librarian, Information Specialist
Brewers Association of Canada
100 Queen Street, Suite 650
Ottawa ON K1P 1J9
Tel.: (613) 232-9106
Fax: (613) 232-2283
E-mail: egregory@brewers.ca

Construction Sector Task Force
Jeff Morrison
Director of Public Relations
Canadian Construction Association
75 Albert Street, Suite 400
Ottawa ON K1P 5E7
Tel.: (613) 236-9455
Fax: (613) 236-9526
E-mail: jeff@cca-acc.com

Dairy Sector Task Force
Gavin Wells
Corporate Energy Manager
Parmalat Dairy & Bakery Inc.
25 Rakely Court
Etobicoke ON M9C 5G2
Tel.: (416) 641-2943
Fax: (416) 622-4180
E-mail: gavin_wells@parmalat.ca

Electrical and Electronics Sector Task Force
Steve Horvath
Horvath Consultants
71 Truman Road
North York ON M2L 2L7
Tel.: (416) 575-2335
Fax: (416) 385-1951
E-mail: brenda.horvath@sympatico.ca

Electricity Generation Sector Task Force
Valerie Snow
ECR Program Manager
Canadian Electricity Association
1155 Metcalfe St., Suite 1120
Montréal QC H3B 2V6
Tel.: (514) 576-9193
Fax: (514) 489-7406
E-mail: snow@canelect.ca

Fertilizer Sector Task Force
David Finlayson
Director, Technical Affairs
Canadian Fertilizer Institute
350 Sparks Street, Suite 802
Ottawa ON K1R 7S8
Tel.: (613) 230-2597
Fax: (613) 230-5142
E-mail: dfinlayson@cfi.ca

Food and Beverage Sector Task Force
Walter Kraus
Director, Environmental Affairs
George Weston Ltd.
22 St. Clair Avenue East, Suite 1901
Toronto ON M4T 2S8
Tel.: (416) 922-1383, Ext. 5414
Fax: (416) 922-4395
E-mail: walter.kraus@weston.ca

Foundry Sector Task Force
Judith Arbour
Executive Director
Canadian Foundry Association
1 Nicholas Street, Suite 1500
Ottawa ON K1N 7B7
Tel.: (613) 789-4894
Fax: (613) 789-5957
E-mail: judy@foundryassociation.ca

General Manufacturing Sector Task Force – Central
Dorian S. Lavallée
Director, Sales & Marketing
Avon Fluid System Technologies Inc.
705 Progress Avenue, Unit 55
Scarborough ON M1H 2X1
Tel.: (416) 438-1233
Fax: (416) 438-1239
E-mail: dlavallee@afst.ca

General Manufacturing Sector Task Force – East
André Desroches
Vice-President, Fabrication, Eastern Canada
EMCO Limited – Building Products
9510 Saint-Patrick Street
LaSalle QC H8R 1R9
Tel.: (514) 364-7528
Fax: (514) 364-4487
E-mail: ades@emcoltd.com

General Manufacturing Sector Task Force – West
Steve Hertzog
Plant Manager
EMCO Building Products Canada
(A Division of EMCO Limited)
P.O. Box 576
Edmonton AB T5J 2K8
Tel.: (780) 440-7321
Fax: (780) 465-1181
E-mail: shertzog@emcoltd.com

Lime Sector Task Force
Dick Bowman
General Manager
Carmeuse Lime (Beachville) Limited
P.O. Box 98
Ingersoll ON N5C 3K1
Tel.: (519) 423-6283, Ext. 330
Fax: (519) 423-6135
E-mail: dick.bowman@carmeusena.com

Mining Sector Task Force
Lauri Gregg
Director of Energy Management – Noranda-Falconbridge
Falconbridge Limited
207 Queen's Quay West, Suite 800
Toronto ON M5J 1A7
Tel.: (416) 982-7076
Fax: (416) 982-3543
E-mail: lauri.gregg@toronto.norfalc.com

Oil Sands Sector Task Force
Kees Versfeld
Energy Management Leader
Syncrude Canada Ltd.
P.O. Box 4009, Mail Drop #2030
Fort McMurray AB T9H 3L1
Tel.: (780) 790-8605
Fax: (780) 790-4875
E-mail: versfeld.kees@syncrude.com

Petroleum Products Task Force
Bob Clapp
Vice-President, Ontario Division
Canadian Petroleum Products Institute
20 Adelaide Street East, Suite 901
Toronto ON M5C 2T6
Tel.: (416) 492-5677, Ext. 33
Fax: (416) 492-2514
E-mail: bobclapp@cppi.ca

Pulp and Paper Sector Task Force
Catherine Cobden
Vice-President, Environment
Forest Products Association of Canada
99 Bank Street, Suite 410
Ottawa ON K1P 6B9
Tel.: (613) 563-1441
Fax: (613) 563-4720
E-mail: ccobden@fpac.ca

Rubber Sector Task Force
Glenn Maidment
President
The Rubber Association of Canada
2000 Argentia Road
Plaza 4, Suite 250
Mississauga ON L5N 1W1
Tel.: (905) 814-1714
Fax: (905) 814-1085
E-mail: glenn@rubberassociation.ca

Steel Sector Task Force
Bob Downie
Environmental Co-ordinator
Gerdau Ameristeel Cambridge Inc.
160 Orion Place
P.O. Box 1734
Cambridge ON N1T 1R9
Tel.: (519) 740-2488, Ext. 1306
Fax: (519) 623-2062
E-mail: bdownie@courticesteel.com

Textiles Sector Task Force
Peter Chantraine
Manager, Energy and Environment
DuPont Canada Inc.
455 Front Road
P.O. Box 2100
Kingston ON K7L 4Z6
Tel.: (613) 548-5025
Fax: (613) 548-5356
E-mail: peter.chantraine@can.dupont.com

Transportation Equipment Manufacturing Sector Task Force
Paul Hansen
Manager, Environmental Affairs
DaimlerChrysler Canada Inc.
4510 Rhodes Drive, Suite 210
Windsor ON N8W 5K5
Tel.: (519) 973-2864
Fax: (519) 973-2613
E-mail: plh2@daimlerchrysler.com

Upstream Oil and Gas Sector Task Force
John E. Squarek
Manager, Alberta Operations
Canadian Association of Petroleum Producers
350 – 7th Avenue Southwest, Suite 2100
Calgary AB T2P 3N9
Tel.: (403) 267-1112
Fax: (403) 266-3214
E-mail: squarek@capp.ca

Wood Products Sector Task Force
Jean-Claude Mercier
Vice-President, Eastern Division
Forintek Canada Corp.
319 Franquet Street
Sainte-Foy QC G1P 4R4
Tel.: (418) 659-2647
Fax: (418) 659-2922
E-mail: jean-claude.mercier@qc.forintek.ca

Canada's Climate Change Voluntary Challenge and Registry Inc. (VCR Inc.)
Bob Flemington
President
VCR Inc.
170 Laurier Avenue West, Suite 600
Ottawa ON K1P 5V5
Tel.: (613) 565-5151
Fax: (613) 565-5743
E-mail: rflemington@vcr-mvr.ca

SECTOR REPORTS

Aluminum

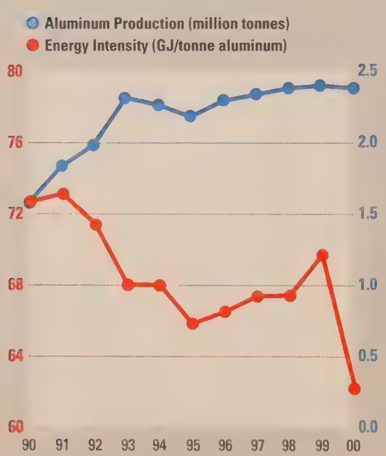
Profile *In 2002, Canada's aluminum sector ranked third in the world in annual primary aluminum production. The combined output of the industry's 10 aluminum plants in the province of Quebec and one in British Columbia is a major contributor to Canada's national and local economies. Although production increases have forced the industry's total energy usage slightly upward, measurements of energy efficiency continue to demonstrate much-improved performance compared with 1990 benchmark levels.*

Performance Highlights

- In January 2002, the industry signed a framework agreement on GHG emissions with the province of Quebec.
- Alcan Inc. will reduce total annual emissions at its facilities in the province of Quebec by 285 000 tonnes of CO_2e by the end of 2003 compared with a baseline year of 1999.
- Alcoa Inc. will cut annual emissions by 200 000 tonnes of CO_2e between the beginning of 2001 and the end of 2004.
- Aluminerie Alouette Inc. will cut its emissions by 12.3 percent on average over the 1996–2004 period.
- The industry reports that on average it has reduced its CO_2e intensity per tonne of aluminum produced from 5.59 tonnes of CO_2e per tonne of aluminum in 1990 to 3.94 in 2000.

Aluminum Sector – NAICS 331313

Energy Intensity and Physical Output (1990–2000)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry 1990–2000.* January 17, 2002. Simon Fraser University.

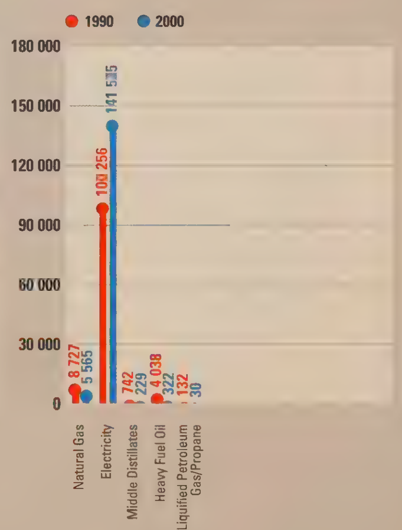
Aluminum Sector – NAICS 331313

Energy Intensity Index (1990–2000)
Base Year 1990 = 1.00

Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry 1990–2000.* January 17, 2002. Simon Fraser University.

Aluminum Sector – NAICS 331313

Energy Sources in Terajoules per Year (TJ/yr.)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry 1990–2000.* January 17, 2002. Simon Fraser University.

ACTIONS

An industrial sector that supports the objectives of the Kyoto Protocol, the Canadian aluminum industry has undertaken numerous actions to reduce GHG emissions and improve energy efficiency.

A framework agreement on voluntary reductions of GHG emissions between the province of Quebec and the aluminum industry was signed in January 2002. The agreement calls for GHG reductions of approximately 200 000 tonnes of CO_2e for the sector between 2002 and 2007. Energy intensity improvements and attention to product life-cycle issues are also built into the agreement.

Following the signing, aluminum producers began negotiations to conclude detailed individual agreements. In June 2002, Alcoa Inc. committed to voluntary reductions of GHG emissions for its smelters in Baie-Comeau, Bécancour and Deschambault and for its rod plant in Bécancour. Under its agreement with the Quebec provincial government, Alcoa will cut its annual emissions by 200 000 tonnes of CO_2e between the beginning of 2001 and the end of 2004, with further reductions planned before the agreement expires at the end of 2007.

In October 2002, Alcan Inc. agreed to voluntarily reduce GHG emissions from its six smelters in the province of Quebec, its aluminum plant in Vaudreuil, and its port facilities, power generation plants and railway operations. Under the agreement, Alcan will reduce total annual emissions from these facilities by 285 000 tonnes of CO_2e by the end of 2003 compared with a baseline year of 1999.

Aluminerie Alouette Inc. signed an agreement with the Quebec provincial government in February 2003. This agreement calls for the company to reduce its GHG emissions by an average of 12.3 percent for the period 1996–2004 – a total reduction of 69 000 tonnes of CO_2e.

These voluntary agreements demonstrate that aluminum producers recognize the opportunity to build on the industry's track record of emissions reductions, which began in 1990.

Canada's aluminum producers have also included energy efficiency issues in their corporate communications programs. For example, Alcan published a comprehensive report entitled *Alcan's Journey Towards Sustainability*, which discusses key business issues, including the environment and energy management.

In its 2001 publication *Life Magazine*, Alcoa dedicates a full section to energy, including a discussion of energy efficiency programs within the company and energy development projects. The publication presents a course of action, which the company believes will lead to a better quality of life.

Aluminerie Alouette's report *De concert avec le milieu*, a booklet on taking environmental considerations into account, explains how the use of new cathode block material and the development of improved cast iron contributes to the overall energy efficiency of its smelters. The company has also modified its administrative building's heating system and programmed its thermostats, saving about 50 000 litres of heating oil per month in the winter heating season.

ACHIEVEMENTS

Primary aluminum production increased by 73 percent between 1990 and 2002, with the industry's GHG emissions remaining stable. Over the same period, the sector reduced its GHG emissions per unit of production by more than 36 percent of CO_2e per tonne produced. Since 1990, the aluminum sector has reduced its emissions of tetrafluoroethane (CF_4) and hexafluoroethane (C_2F_6) by approximately 52 percent.

According to industry forecasts, the production of primary aluminum in Canada should increase by 1.4 million tonnes by 2010, leading to process emissions increases of 3 million tonnes of CO_2e. On average, the industry reduced its CO_2e intensity from 5.59 tonnes of CO_2e per tonne of aluminum in 1990 to 3.94 in 2000. The industry expects that by 2010, overall intensity will be reduced further to 3.07 or even lower.

CHALLENGES

The industry will continue to make ongoing energy efficiency gains by implementing enhanced manufacturing processes and advanced energy management practices. However, the construction of new, state-of-the-art smelters, which currently have a carbon intensity of less than 2 tonnes of CO_2e per tonne of production, and the retrofit of some other smelters will have the most dramatic impact on the sector's overall energy efficiency and GHG emissions. Modern facilities currently account for 72 percent of total aluminum production.

However, building new facilities requires sizable capital investments and the availability of large quantities of electricity at favourable prices. The combination of low aluminum prices and high energy costs that are typical of today's marketplace will make it difficult for the industry to generate the funds needed to finance these investments. Developing workable economic models for the continued development of new facilities remains a significant challenge for the industry.

Brewery

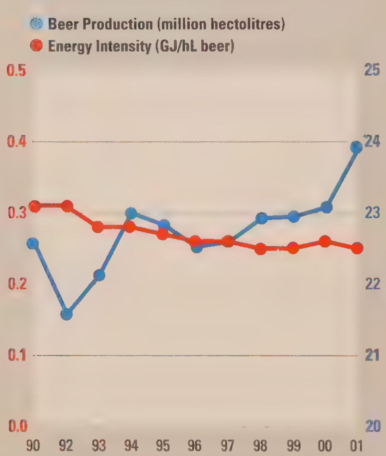
Profile *Brewing in Canada is a diverse and modern industry that is actively pursuing ambitious energy efficiency targets. The industry is made up of two national brewing companies, several regional brewers and numerous microbreweries. Together, these establishments, which employ more than 14 000 workers in 83 breweries across Canada, produced about 24 million hectolitres of beer in 2001.*

Performance Highlights

- Enhanced maintenance, monitoring and control procedures are enabling brewers to identify and implement energy-saving measures.
- Compared with production in 1990, the industry has reduced its energy consumption by more than 19 percent per hectolitre of beer produced.
- The industry remains committed to an annual energy reduction of 1 percent over the next two years and, beginning in 2004, 1.5 percent annually through 2006.

Brewery Sector – NAICS 312120

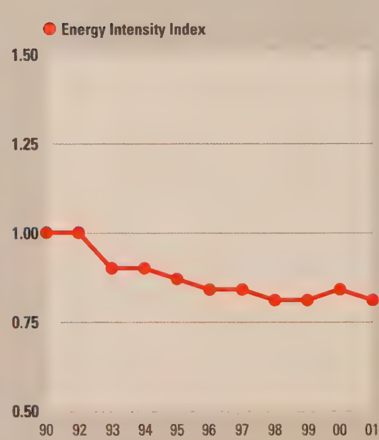
Energy Intensity and Physical Output (1990–2001)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry 1990–2001.* December 20, 2002. Simon Fraser University.

Brewery Sector – NAICS 312120

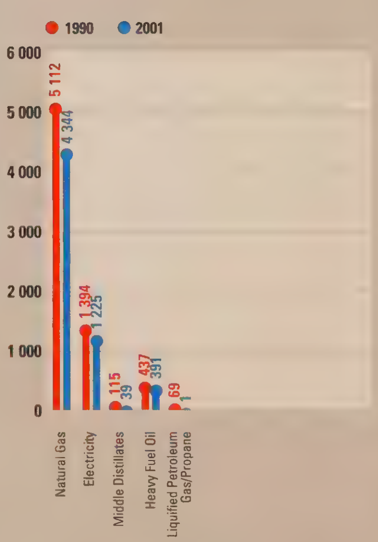
Energy Intensity Index (1990–2001)
Base Year 1990 = 1.00



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry 1990–2001.* December 20, 2002. Simon Fraser University.

Brewery Sector – NAICS 312120

Energy Sources in Terajoules per Year (TJ/yr.)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry 1990–2001.* December 20, 2002. Simon Fraser University.

ACTIONS

Canada's brewers continue to pursue energy efficiency by improving their beer-making processes, plant infrastructure and packaging activities. Capital investment in new bottle-washing and pasteurization equipment will help the sector improve energy efficiency and reduce GHG emissions. Continuously advancing monitoring, control and maintenance procedures are enabling brewers to identify and implement opportunities for improvement. These measures include advances in production process systems, waste-trimming enhancements to post-run shutdown procedures and upgrades to heating, ventilating, lighting and air-conditioning systems. Companies are working to entrench accountability for energy and utility management throughout their organizations, creating an environment that supports efforts to implement and sustain energy efficiency projects and practices.

For example, energy planning, monitoring and targeting, departmental accountability and employee participation are being combined in a comprehensive effort to improve energy efficiency. Brewers are using energy audits and staff accountability to focus employee attention on conservation and on opportunities to reduce energy waste. Extensive benchmarking helps to identify and implement a best-practices approach. Capital projects are assessed to ensure that they are designed for – and incorporate – energy efficiency strategies.

On the distribution and sales side of the sector, The Beer Store installed special computers in trucks in its fleet in London, Ontario, which reduced idling, saved fuel and extended the trucks' working life. Thanks to this pilot project, the fleet reduced its idling time by 3000 hours, or 51 percent, saving more than 32 000 litres of fuel and reducing emissions by more than 114 tonnes. The project's success earned The Beer Store a Fleet Excellence Award from the national Repair Our Air – Fleet Challenge.

ACHIEVEMENTS

The Canadian brewing industry has made significant progress in increasing energy efficiency. Compared with 1990, the industry now uses over 19 percent less energy to produce a hectolitre of beer. In 2001, the industry consumed 6003 TJ of energy, 72 percent of which was natural gas, 7 percent fuel oil and 20 percent electricity. The brewing industry is committed to an energy-reduction target of 1 percent per year over the next two years and, beginning in 2004, 1.5 percent annually through 2006.

CHALLENGES

Canadian brewers continue to identify ways to reduce expenditures while maintaining quality and innovation. In the face of increased international competition and the growth of other non-beer beverage categories, the industry combines innovative marketing strategies with prudent cost-management programs. Canada's brewers also have successfully pursued international markets and made Canada one of the top beer exporters in the world. Several companies have negotiated agreements to produce products in Canada that would otherwise be imported. Brands available in the Canadian market range from traditional ales and lagers to new beverages that feature varying strengths of alcohol, distinctive flavours and unique textures. Clearly, the industry is well positioned to meet its competition head-on.

Because energy is a substantial cost component in the brewing process, finding ways to improve energy efficiency will continue to be a priority for Canada's brewers.

Cement

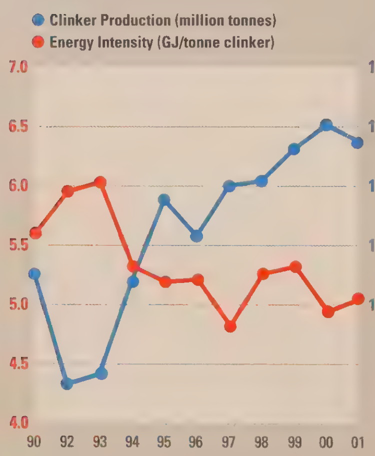
Profile *The cement industry is the cornerstone of Canada's domestic construction industries and a significant exporter that contributes substantially to the country's balance of payments. According to Statistics Canada figures, the industry's eight companies, which operate 16 processing facilities, produced 12.7 million tonnes of clinker and 12.8 million tonnes of cement in 2001.*

Performance Highlights

- Ciment Québec Inc. saved electricity by modifying the way it transports raw material from the roller mill to the kiln.
- Lafarge Canada Inc. continues to invest in energy efficiency in plants across Canada.
- The use of the cement replacement GranCem® is enabling St. Lawrence Cement Inc. to accommodate much of its market growth without increasing energy consumption.
- Lehigh Inland Cement Limited has implemented a program to replace aging equipment with more energy-efficient alternatives and has been working to improve the energy efficiency of its compressed-air systems and process fans.
- The cement sector's use of waste fuel declined slightly to 3038 terajoules, which is 6.1 percent of the total energy (excluding electricity) used by the sector in 2001.
- The sector anticipates a 2 percent decrease in GHG intensity per unit of production by 2010.

Cement Sector – NAICS 327310

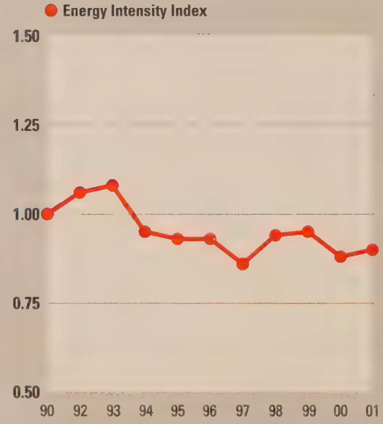
Energy Intensity and Physical Output (1990–2001)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry 1990–2001.* December 20, 2002. Simon Fraser University.

Cement Sector – NAICS 327310

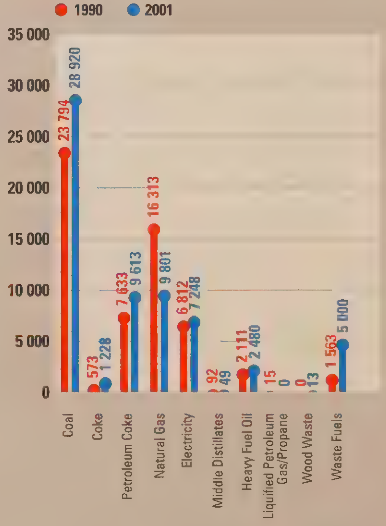
Energy Intensity Index (1990–2001)
Base Year 1990 = 1.00



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry 1990–2001.* December 20, 2002. Simon Fraser University.

Cement Sector – NAICS 327310

Energy Sources in Terajoules per Year (TJ/yr.)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry 1990–2001.* December 20, 2002. Simon Fraser University.

ACTIONS

Cement manufacturers continue to take action to improve energy efficiency. For example, Ciment Québec Inc. of Saint-Basile, Quebec, has modified the way it transports raw material from the roller mill to the kiln. Before the modification, material was moved by two compressed-air pumps, drawing 575 kW of electricity. The new system employs an electric elevator that uses only 75 kW to operate and achieves the same objective.

A new kiln at Lafarge Canada Inc.'s plant in Richmond, British Columbia, reached its energy intensity targets in 2001, using 3058 MJ per tonne of clinker. Before the new kiln was installed, fuel consumed by its two wet process kilns was 6307 MJ per tonne of clinker. At its plant in Exshaw, Alberta, Lafarge made major investments to equip the facility to burn coal, including the installation of a coal mill system to supply ground coal to both of the facility's kilns. The company also installed new dust collectors to further reduce emissions. At Lafarge's plant in Kamloops, British Columbia, chain-system upgrades, the implementation of combustion-control expert systems, cooler-optimization exercises and an easier-to-burn raw mix enabled the facility to reduce its fuel consumption to 4249 MJ from 4533 MJ per tonne of clinker.

St. Lawrence Cement Inc. and St. Marys Cement are joint owners of Great Lakes Slag, a venture in Sault Ste. Marie, Ontario, that processes granulated steel mill blast furnace slag for use as a partial replacement for cement. St. Lawrence Cement grinds the granulated slag at its plant in Mississauga, Ontario, to produce GranCem®, a supplementary cementitious material that can reduce the proportion of Portland cement used in the production of concrete. GranCem®, which may be blended in a mixture with cement in a ratio of 1 to 3 or 1 to 4, reduces the embodied energy of the final concrete product by about 20 percent of the contained energy of the final concrete. Used properly, GranCem® also improves the mechanical properties and durability of concrete. GranCem® production enables St. Lawrence Cement to accommodate much of its market growth without corresponding increases in energy consumption.

St. Lawrence Cement is also using waste materials to provide part of the energy component in cement. The company has installed a $6 million granular fuel system at its facility in Joliette, Quebec, which will allow the plant to burn waste material such as sawdust, tire fluff, rubber chips and dried sewage sludge in two of its four kilns. The new system will enable the company to offset the burning of about 42 000 tonnes of coal and coke fuel per year by co-processing material that would otherwise be incinerated or sent to landfill.

Lehigh Inland Cement Limited's facility in Edmonton, Alberta, has established a corporate energy management plan and implemented a program to replace aging equipment with alternatives that are more energy efficient. In recent years, the company has focused on upgrading its motor drive systems and production process equipment. In 2002, Inland installed power-monitoring equipment to monitor and reduce electricity consumption in all process areas of its plant.

Lehigh Inland has been working to improve the energy efficiency of its compressed-air systems and process fans. The company continues to upgrade fans with replacements that are more modern and energy efficient and has launched efforts to improve plant productivity.

The Cement Sector Task Force's recently established energy committee is now working to help sector companies share information and develop joint actions on issues such as power deregulation, energy trends, increased use of waste fuel, CO_2 emissions and demand.

ACHIEVEMENTS

Canada's cement sector has reduced its fuel consumption by 30 percent per tonne between 1970 and 1990, principally by implementing major process improvements, according to the Cement Association of Canada (CAC). Kiln efficiency improved by 11 percent between 1990 and 2000, and direct emissions of CO_2 per tonne of cementitious product were 8 percent lower over the same period. The CAC projects a further 2 percent decrease in GHG intensity per unit of production by 2010.

Since 1990, the cement sector has managed to reduce its overall energy intensity by 11.1 percent while demand for its products increased 19.3 percent. The expanded use of power monitoring, targeting and other systems and technologies will combine with ongoing plant modernizations to produce further energy efficiency improvements within the sector.

The cement industry continues to work closely with governments and other industries to promote "concrete" solutions to environmental issues and sustainable, durable infrastructure. For example, the intelligent use of cement-based products in the transportation, residential housing and agriculture sectors can improve energy efficiency and reduce GHG emissions in these sectors, thereby supporting Canada's Kyoto goals.

CHALLENGES

With energy making up a substantial portion of the cost of producing cement, energy consumption is a significant competitive issue within the cement industry. Although the importance of energy has traditionally led many companies to treat energy cost-reduction information as confidential, there is a growing consensus that the benefits of sector-wide cooperation outweigh the competitive risks. The CAC believes that this shift in attitude will lead to broader information sharing and cooperation among sector companies.

There is concern in Canada's cement sector, especially among major exporters, that the current slowdown in the U.S. economy, especially in construction, will have an increasingly adverse impact on energy efficiency. Energy intensive cement production processes are most efficient when operating as close as possible to full capacity, and weakness in demand can trigger corresponding declines in cement plant throughput.

Long-standing discussions among waste producers and waste users have not yet yielded an appropriate methodology to establish emissions-related credits for waste material use in the production of cement. Moreover, the potential implementation of economic instruments such as a carbon tax could seriously impair Canada's cement exports.

Chemical

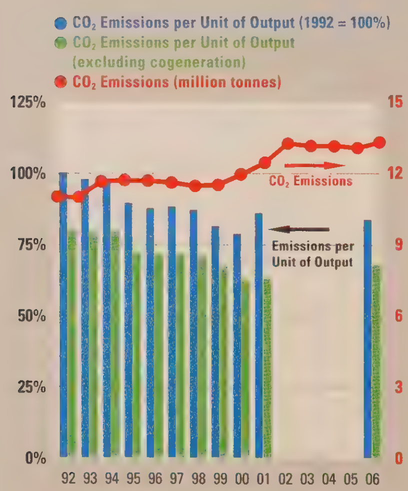
Profile *The chemical sector encompasses a diverse industry that produces organic and inorganic chemicals, plastics and synthetic resins. The chemical industry is the third largest in Canada in terms of value of shipments. Companies in this sector operate 775 facilities Canada-wide, directly employing more than 24 000 people, with an annual payroll of $1.3 billion. The Canadian Chemical Producers' Association (CCPA) is the trade association that represents manufacturers in this sector. Its member companies produce more than 90 percent of industrial chemicals manufactured in Canada.*

Performance Highlights

- NOVA Chemicals Corporation's cogeneration power plant in Joffre, Alberta, has enabled the company to reduce net emissions by 20 percent in 2001.
- Petresa Canada decreased its CO_2e emissions per unit of production by 2.6 percent in 2001.
- In building a new monoethylene glycol plant, Shell Chemicals Canada Ltd. incorporated a number of features aimed at minimizing or eliminating GHG emissions.
- Between 1996 and 2001, Methanex Corporation reduced its CO_2 emissions per tonne of production from 0.76 tonne to 0.67 tonne.
- Dow Chemical Canada Inc. is pioneering the use of wheat straw as a wood replacement in the manufacture of composite panel building materials.
- CCPA member companies' total GHG emissions in 2001, expressed as CO_2 equivalent, decreased 40 percent from 1992 levels.

Chemical Sector – NAICS 325100, 325210

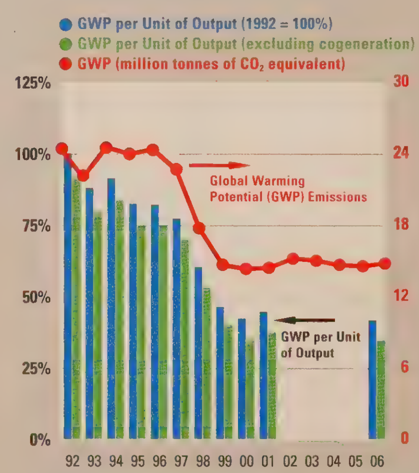
Carbon Dioxide Emissions vs. Product Output



Data source: CCPA Member Operations, February 2003

Chemical Sector – NAICS 325100, 325210

Global Warming Potential vs. Product Output



Data source: CCPA Member Operations, February 2003

ACTIONS

The CCPA's Responsible Care® initiative, which guides chemical companies in their environmental activities, incorporates detailed principles for reducing emissions. In keeping with Responsible Care® guidelines, CCPA member companies continued to pursue actions to promote energy efficiency in 2001. For example, NOVA Chemicals Corporation's electricity/steam cogeneration power plant at the company's manufacturing facility in Joffre, Alberta, continues to help move toward lower total GHG emissions. Compared with conventional electricity sources, the cogeneration facility produces about half of the emissions per unit of output and has enabled the company to reduce net emissions by 20 percent in 2001 compared with 2000. The company projects that by 2004 its net emissions will be significantly below 1990 levels. NOVA Chemicals' goal is to reduce its net emissions intensity from its Canadian chemical facilities by 25 percent below 1999 levels by 2005.

Petresa Canada, based in Bécancour, Quebec, has made considerable effort to reduce its GHG emissions. The ISO 14001 registered company regularly monitors and audits its GHG emissions and continuously seeks ways to improve its performance. In 2001, Petresa decreased its CO_2e emissions per unit of production by 2.6 percent. Since its plant began operations in 1995, the company has reduced its emissions intensity by 20 percent.

In building its new monoethylene glycol plant at its facility in Scotford, Alberta, Shell Chemicals Canada Ltd. incorporated a number of features aimed at minimizing or eliminating GHG emissions. The company integrated heating systems at its facilities, partnered with Air Liquide Canada Inc. to recover and sell waste CO_2, and established a cogeneration facility to produce electricity and heat. In its first part-year of operation in 2000, the plant reduced its total emissions ratio to 0.94 tonne of CO_2e per tonne of product. When the last phases of plant integration were completed in 2001, the total emissions ratio had dropped to 0.72 tonne. Emissions projections through 2007 predict further reductions in the coming years.

At Methanex Corporation, operational excellence is a key component in emissions-reduction efforts. By instituting stringent preventive and predictive maintenance programs, the company has significantly reduced the frequency of energy-wasting plant shutdowns, raising reliability to an impressive 98.36 percent in 2001. Methanex has also developed procedures to direct process gases into fuel systems during shutdown periods, thereby significantly reducing gas flaring and venting. Between 1996 and 2001, Methanex reduced its CO_2 emissions per tonne of production from 0.76 tonne to 0.67 tonne.

Dow Chemical Canada Inc. takes a broad view of emissions reduction. Besides establishing new cogeneration facilities at its plants in Fort Saskatchewan, Alberta, and Sarnia, Ontario, Dow is pioneering the use of wheat straw as a wood replacement in the manufacture of composite panel building materials. This helps to preserve forests and eliminate the needless burning of agricultural waste. Dow also sells hydrogen, a by-product previously burned as a fuel, to a customer whose process requires hydrogen. Dow will replace the energy lost by the sale with natural gas (raising its own GHG emissions), but the customer will no longer need to manufacture hydrogen – a trade-off that produces a net benefit to the environment.

ACHIEVEMENTS

In 2001 the chemical sector's energy consumption totalled 189 649 TJ. According to data released in the CCPA's latest Responsible Care® report, from 1992 to 2001, member companies' CO_2 emissions levels increased by 13 percent, and CO_2 emissions per unit of output decreased 14 percent. However, product output increased by 31 percent over the same period. Total GHG emissions in 2001, expressed as CO_2 equivalents, decreased by 40 percent from 1992 levels.

In 2001, member companies' emissions of methane declined by 14.9 percent compared with 2000, continuing a seven-year reduction trend. Similarly, emissions of N_2O continued to decline by 11.4 percent – a total decrease of 91.7 percent since 1992. Measured in terms of global warming potential, emissions in 2001 were 1 percent higher than in 2000 but 40 percent lower than in 1992.

The CCPA estimates that total CO_2 emissions per unit of output will decrease by an additional 3 percent by 2006, 16 percent less than in 1992. Including cogeneration, members expect a 21 percent increase in total emissions of CO_2 by 2006 compared with 1992. By 2006, GHG emissions, expressed in terms of global warming potential per unit of output, are projected to decrease by 58 percent compared with 1992, or by 65 percent when excluding cogeneration emissions.

CHALLENGES

CCPA members are guided by technological, economic and legislative considerations as they pursue improved environmental performance and enhanced global competitiveness. Members face an ongoing challenge to reduce GHG emissions while accommodating ongoing growth in their operations and their output. Canada's participation in the Kyoto Protocol has made this challenge more complex.

It is no surprise that as production levels increase, the energy requirements of CCPA members have also increased. However, despite the pressures of growth, many member companies have been able to reduce their CO_2 emissions per unit of product. As integral players in an international market, Canadian facilities must continually invest capital to remain competitive with other regions. These investments frequently affect energy efficiency and GHG emissions.

The chemical industry's continuing growth makes it likely that, although CO_2 emissions per unit of output will continue to improve, total CO_2 emissions will grow. The dramatic improvements already made through application of cogeneration and N_2O abatement technologies will be difficult to replicate.

Construction

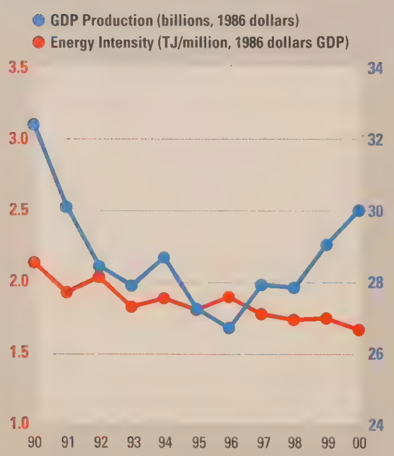
Profile *The construction sector is Canada's largest industry, comprising a diverse array of companies whose work touches every economic sector and region of the country. The construction industry employs a work force of more than 900 000 and generates $134 billion in annual economic activity – about 12 percent of Canada's GDP.*

Performance Highlights

- The Canadian Construction Association (CCA) joined CIPEC in December 2001.
- The construction industry has been a leader among industrial sectors in adopting and implementing environmentally sound business practices.
- CCA has actively participated in the Government of Canada's consultations concerning the ratification of the Kyoto Protocol.
- Following GDP growth of 3.5 percent in 2001 and 3.9 percent in 2002, the industry forecasts growth of 1.9 percent in 2003.
- Economic considerations play a major role in the industry's ability to invest in energy efficiency.

Construction – NAICS 230000[1]

Energy Intensity (excluding electricity) and Economic Output (1990–2000)



Data source: Statistics Canada, *Quarterly Report on Energy Supply-Demand in Canada, 1990–2000.* Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC), *A Review of Energy Consumption and Related Data: Canadian Construction Industry 1990–2000*, Fall 2002.

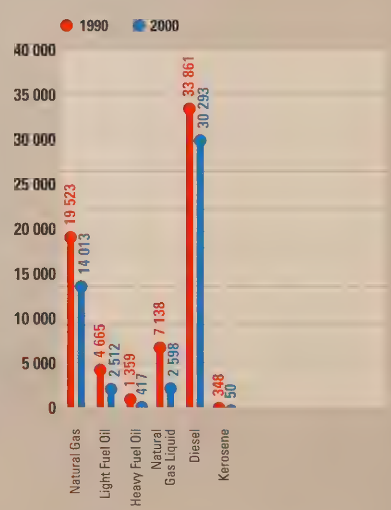
Construction – NAICS 230000[1]

Energy Intensity Index (excluding electricity) (1990–2000) Base Year 1990 = 1.00

Data source: Statistics Canada, *Quarterly Report on Energy Supply-Demand in Canada, 1990–2000.* Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC), *A Review of Energy Consumption and Related Data: Canadian Construction Industry 1990–2000*, Fall 2002.

Construction – NAICS 230000[1]

Energy Sources in Terajoules per Year (TJ/yr.) (excluding electricity)



Data source: Statistics Canada, *Quarterly Report on Energy Supply-Demand in Canada, 1990–2000.* Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC), *A Review of Energy Consumption and Related Data: Canadian Construction Industry 1990–2000*, Fall 2002.

[1] NAICS 236 includes buildings; NAICS 237 includes heavy and civil engineering construction; and NAICS 238 includes specialty trade contractors.

ACTIONS

The construction sector is a new participant in CIPEC, welcomed into the voluntary initiative in December 2001, when the Canadian Construction Association (CCA) joined the program. CCA is the national voice of the construction industry, with a membership of more than 20 000 enterprises. Members work at everything from design and management to road building and general contracting.

The construction industry has been a leader among industrial sectors in adopting and implementing environmentally sound business practices. Sector companies are well aware of the damage that human-induced climate change could cause our planet, our country and our economy.

CCA endorses the concept of sustainable development and recognizes the need to balance environmental and economic considerations in the decision-making process when planning new developments. CCA accepts the need for a fair, equitable and expedient environmental assessment and review process that is developed with the help of industry input. As a result, CCA has actively participated in the Government of Canada's consultations concerning the ratification of the Kyoto Protocol. CCA believes that Canada's response to climate change should adhere to certain basic principles:

- Measures to achieve GHG-reduction objectives must be voluntary rather than mandatory.
- The approach taken must be balanced, not unduly favouring one region or industrial sector over another.
- Measures must ensure that Canada's economy remains competitive in the global marketplace, particularly with regard to the United States.
- The climate change program should recognize that infrastructure improvements play a major role in improving Canada's environmental performance and should include incentives for building renovations/retrofits and for improving essential physical infrastructure such as roads, highways and sewage treatment.
- Measures should take into consideration the current and past efforts of specific industries. For example, the construction industry has made significant reductions in GHG emissions over the past decade.

ACHIEVEMENTS

Energy consumption in the sector is directly related to levels of construction activity. Following GDP growth of 3.5 percent in 2001 and 3.9 percent in 2002, the industry forecasts growth of 1.9 percent in 2003, 2.6 percent in 2004 and only 1.3 percent in 2005. A strong residential construction market caused higher overall growth in 2002. However, anticipated higher interest rates and a lessening of demand will reduce residential construction growth, resulting in slower overall sector growth through 2005.

Non-residential construction is expected to record growth in the 1.4 percent range in 2003, with a variance among industry sub-sectors. The GDP of non-residential building structures will increase by 3.8 percent (led by a 10.9 percent increase in industrial buildings), and GDP growth for roads and highways will be flat with growth of only 0.4 percent. Some sectors, such as oil, gas and utility structures, will record negative GDP growth in 2003; construction GDP in other sectors, such as mining and communications, will reflect robust growth. After strong construction intentions in 2001 and 2002, government construction intentions will drop to growth of 0.6 percent in 2003.

CHALLENGES

The construction sector is committed to improving its energy efficiency. Sector companies continue to upgrade their vehicle fleets and motorized machinery with modern vehicles that are more fuel efficient. They are also continually on the lookout for more energy-efficient materials and practices – elements that can lower costs and reduce GHG emissions. However, economic considerations play a major role in the industry's ability to invest in energy efficiency. Motorized vehicles, machinery and heavy equipment are expensive, requiring companies to make major capital commitments. Given the competitiveness and unpredictability of the construction industry, the desire to upgrade must compete with the need to maximize the return on existing machinery. Balancing these needs often impedes substantial advances in energy efficiency.

Similarly, the sector's diversity makes it difficult to develop energy efficiency programs that are meaningful and practical. What works in constructing roads may not apply to building factories and bridges or to designing and engineering new projects. However, CCA is committed to encouraging its members to become Industrial Energy Innovators and to take advantage of opportunities to improve their energy efficiency. CCA believes that over time its participation in CIPEC will help to accelerate improvements in the environmental performance of Canada's construction industry.

Dairy

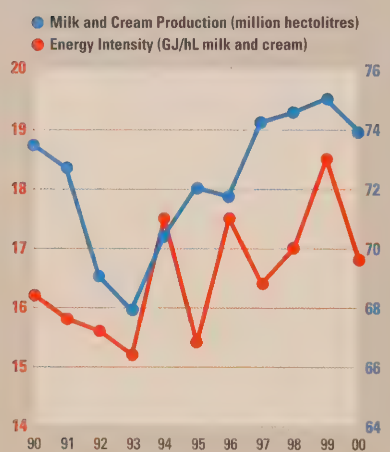
Profile *Canada's dairy product manufacturing sector spans Canada from coast to coast. Operating more than 270 facilities and employing 20 500 people, Canada's dairies processed more than 73 million hectolitres of raw milk and shipped an estimated $5.9 billion worth of milk products in 2000.*

Performance Highlights

- Saputo Inc. has undertaken a series of small projects aimed at reducing energy consumption.
- Parmalat Dairy & Bakery Inc. has developed a corporate energy strategy that aims to lower energy intensity 10 percent by 2006 compared with 2001 levels.
- A major expansion to William Nielson Ltd.'s dairy plant in Ottawa, Ontario, incorporates a range of energy efficiency design features.
- Nestlé Canada Inc. has installed an Electroflow™ system at its dairy plant in Sherbrooke, Quebec.
- An Electroflow™ system at the Atwood Cheese Company Limited reduced electricity consumption by 5 percent in the system's first six months of operation.
- Gay Lea Foods Co-operative Limited uses a system that captures wastewater for cooling.
- In 2001, the sector's total energy consumption was 12 434 TJ, up from 11 952 TJ in 1990.
- The sector's energy intensity is increasing because of consumer demand for products that require more energy to produce.

Dairy Sector – NAICS 311500

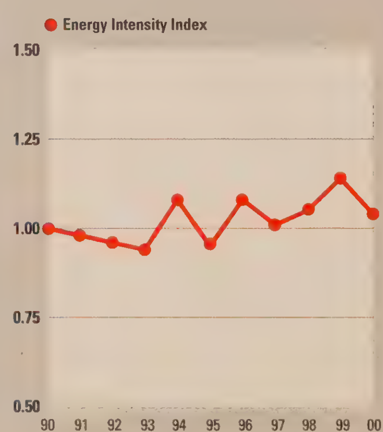
Energy Intensity and Physical Output (1990–2000)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–2000.* January 17, 2002. Simon Fraser University.

Dairy Sector – NAICS 311500

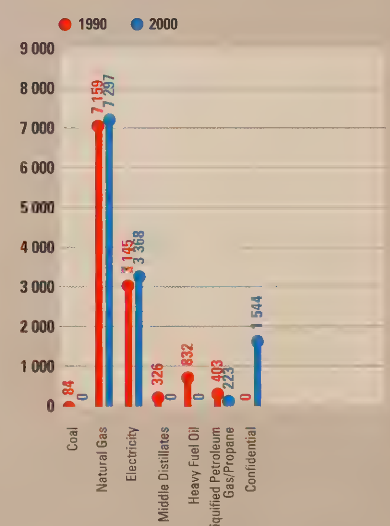
Energy Intensity Index (1990–2000)
Base Year 1990 = 1.00



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–2000.* January 17, 2002. Simon Fraser University.

Dairy Sector – NAICS 311500

Energy Sources in Terajoules per Year (TJ/yr.)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–2000.* January 17, 2002. Simon Fraser University.

ACTIONS

Energy is a key component in milk processing. Typically, dairies employ electrical, thermal and water-based energy systems in their facilities for processes such as pasteurization, churning, washing, packaging, cooling, freezing and drying. Sector companies recognize the importance of energy efficiency in controlling costs and continue to initiate programs to better manage their energy consumption. Dairies have implemented energy-saving programs to encourage recovery and re-use of hot water, recycle tanker wash water, upgrade lighting systems and motors, and minimize air and water leakage. The following are examples of recent energy efficiency efforts by individual companies.

Saputo Inc.'s Milk Division in Edmonton, Alberta, has undertaken a series of small projects aimed at reducing energy consumption. For example, the plant acted to reduce steam generation and took measures to maximize the use of permeate for heating and cooling, thereby offsetting reliance on ammonia refrigerants and boiler-generated steam.

Parmalat Dairy & Bakery Inc. has developed a corporate energy strategy that focuses on capital and continuous improvement opportunities, with the goal of reducing energy intensity by 10 percent below 2001 levels by 2006. Parmalat's energy and environmental teams are working together more closely to establish energy and emissions baselines. Parmalat is also developing a standard energy tracking and forecasting system.

A major expansion to William Nielson Ltd.'s dairy plant in Ottawa, Ontario, includes energy efficiency components such as skylights and metal halide lights. The company is also exploring the possibility of installing SOLARWALL® metal wall cladding and high-efficiency boilers with economizers and adjustable arms. Elsewhere in the plant, Nielson downsized its steam production system to bring capacity in line with demand, enabling the company to replace an older boiler with a more energy-efficient alternative. The company is also converting to high-efficiency motors and has switched its fleet of propane-powered machines to natural gas.

Nestlé Canada Inc. has installed an Electroflow™ system at its dairy plant in Sherbrooke, Quebec. The system, which balances electricity loads at periods of peak demand and downtime, has dramatically reduced the plant's electricity consumption. Nestlé has also implemented a performance contracting program at the plant to manage its refrigeration and airflow programs.

The Atwood Cheese Company Limited has also installed an Electroflow™ system at its dairy plant in Atwood, Ontario. In the system's first six months of operation, it generated more than 5 percent savings in electricity costs. Atwood has also increased motor efficiency at the plant and modified its processes to reduce spikes in power consumption.

Gay Lea Foods Co-operative Limited uses a system that reduces water consumption through an enclosed circulation loop, captures energy from re-circulating water for cooling and reclaims cheese fines, which previously were discharged into the sewage system. The system uses an ammonia membrane (welded plate) heat exchanger that keeps process water in an enclosed system. This decreases water consumption by 80 percent, reduces the surcharge for biological oxygen demand (BOD) by 50 percent and decreases electricity consumption by 50 percent. The system also reclaims lost cheese solids from the water, increasing process yield by 0.6 percent.

ACHIEVEMENTS

Energy efficiency efforts have enabled dairy sector companies to lower their costs and improve their operating efficiency. Energy data for the year 2001 are not yet available. In 2000, the sector's total energy consumption was 12 434 TJ, up slightly from the 1990 level of 11 952 TJ. The amount of milk and cream produced in 2000 increased from 1990 levels. Since 1996, consumer demand for more energy intensive products has offset the sector's progress in improving energy efficiency. Despite this upward pressure on energy consumption, the energy consumed per hectolitre of output decreased in 2000 to 16.8 GJ from 18.5 GJ in 1999.

CHALLENGES

Following the disbanding of the National Dairy Council of Canada in 2001, the sector has re-established an active Dairy Sector Task Force and is now recruiting provincial dairy associations. Begun in 2002, this work is now showing results and should expand the CIPEC presence within the sector in the years to come. A recent study has shown that sector companies that are not CIPEC participants have increased their energy consumption at double the rate of those that do participate in CIPEC. This makes it essential for the task force to broaden its reach within the sector.

For many dairy product manufacturers, unstable energy prices and the scarcity of capital make developing a sound business case for investments in energy efficiency a significant challenge. Moreover, the rationalization and competitive pressures that have emerged in recent years continue to drive the industry to downsize facilities in the face of static sales.

Today's marketplace demands that dairies provide innovative, high-quality and value-added products at the best possible prices. Unfortunately, creating these value-added products often conflicts with efforts to improve energy efficiency. Manufacturers have already made the most of the low-cost and no-cost energy efficiency improvements available to them. Their greatest challenge in the foreseeable future is to make the more costly, payback-delayed improvements that will further advance energy efficiency.

Electrical and Electronics

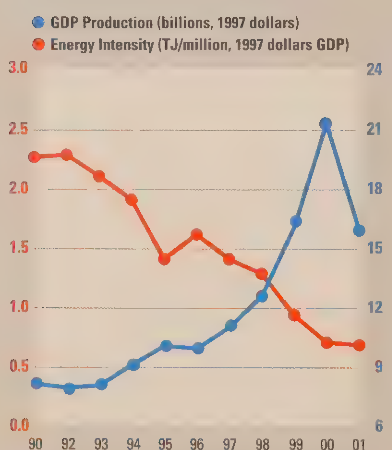
Profile *The electrical and electronics sector includes a diverse array of companies that produce electrical appliances, lighting, consumer electronics, communications and electronic equipment, cabling, office equipment, industrial equipment and other electrical products. These companies operate more than 1400 facilities and employ more than 100 000 workers across Canada. The industry is a major exporter and a vital, growing contributor to the national economy.*

Performance Highlights

- The electrical and electronics sector is Canada's least energy intensive industry.
- Litton Systems Canada Ltd. retrofitted its 45-year-old facility in Toronto, Ontario, with the latest in energy-efficient lighting systems.
- In 2001 IBM Canada Ltd. achieved exceptional energy conservation results, reducing overall energy consumption by 2.4 percent, despite an 11 percent increase in occupied area.
- Between 1990 and the end of 2001, the sector's energy consumption remained relatively constant despite substantial growth in production.
- The sector has decreased its energy intensity by nearly 70 percent from 1990 through 2001.
- The industry anticipates a significant decrease in energy consumption in the coming years.
- Many sector products decrease CO_2 emissions by increasing the energy efficiency of other industries.

Electrical and Electronics Sector – NAICS 334, 335[1]

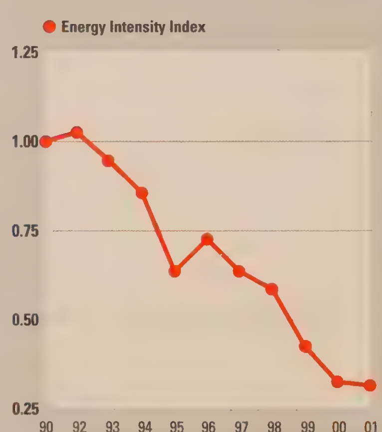
Energy Intensity and Economic Output (1990–2001)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC), *Development of Energy Intensity Indicators for Canadian Industry: 1990–2001.* December 20, 2002. Simon Fraser University.

Electrical and Electronics Sector – NAICS 334, 335[1]

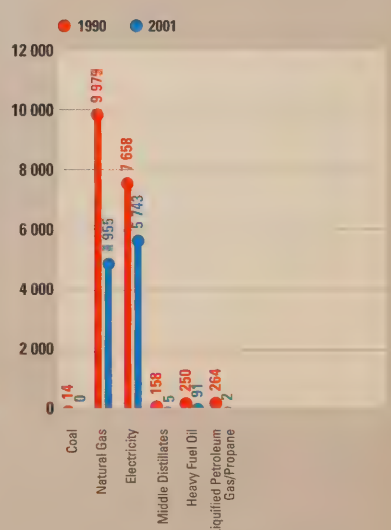
Energy Intensity Index (1990–2001)
Base Year 1990 = 1.00



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC), *Development of Energy Intensity Indicators for Canadian Industry: 1990–2001.* December 20, 2002. Simon Fraser University.

Electrical and Electronics Sector – NAICS 334, 335[1]

Energy Sources in Terajoules per Year (TJ/yr.)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC), *Development of Energy Intensity Indicators for Canadian Industry: 1990–2001.* December 20, 2002. Simon Fraser University.

[1] Computers, Electronic Products, Electrical Equipment

ACTIONS

Across the electrical and electronics sector, companies are strong proponents of environmental sustainability and energy efficiency. Although the industry is one of Canada's least energy intensive, many companies have incorporated energy efficiency programs into their efforts to control costs.

For example, Litton Systems Canada Ltd. retrofitted its 45-year-old facility in Toronto, Ontario, with the latest in energy-efficient lighting systems. The comprehensive program included undertaking a building-wide analysis of lighting requirements, carefully selecting the correct lighting system for each functional area and installing a computerized lighting control system. The retrofit is saving Litton approximately 113 000 kWh of electricity per month, or about $100,000 per year.

In September 2001, IBM Canada Ltd. celebrated the opening of its Toronto Software Lab in Markham, Ontario. Housing more than 2300 software developers, engineers and support staff, the property is the third largest research facility in Canada. Energy efficiency, environmental management and wildlife habitat protection were a mandatory part of the facility's overall design strategy. Energy conservation was built into the lighting and climate systems, and heating and cooling is provided by the local municipality's first cogeneration plant. These energy initiatives earned the lab a $320,000 incentive through the Commercial Building Incentive Program, which is administered by NRCan's Office of Energy Efficiency.

Company-wide, IBM Canada's continuous review of its business has enabled it to consolidate operations into fewer and larger locations, thus decreasing costs and saving energy and other resources. Mobility initiatives give employees the tools needed to work from home, reducing space requirements, energy consumption and transportation fuel. Currently, 26 percent of the company's staff, or 4700 employees, do not have dedicated office space. It is estimated that, with the reduction in travelling to and from work, these employees save 48 tonnes of pollutants and GHG emissions (including CO_2) per year.

In 2001 IBM Canada achieved exceptional energy conservation results, reducing overall energy consumption by 2.4 percent, despite an 11 percent increase in occupied area and cutting energy consumption density (MWh/sq. ft. per year) by 12.85 percent. Energy efficiency measures conserved 26 076 MWh, leading to 2657 tonnes of CO_2 emissions avoidance. The cumulative CO_2 emissions reduction from the base year 1990 was 34 863 tonnes by the end of 2001.

ACHIEVEMENTS

Natural gas and electricity satisfy virtually all of the electrical and electronics industry's energy requirements. In 2001 the industry consumed 10 798 TJ of energy, representing 0.4 percent of the energy consumed by the mining and manufacturing sector as a whole and less than 1 percent of total energy-related manufacturing CO_2 emissions. On average, energy expenditures represent less than 1 percent of the value of the industry's shipments, compared with more than 61 percent for materials and supplies and 16 percent for labour.

Between 1990 and the end of 2001, the sector's energy consumption remained relatively constant despite substantial growth in production. These factors have combined to decrease energy intensity by nearly 70 percent. Acquisitions, mergers and internal rationalization are enabling the industry to realize increased efficiencies of scale, which are expected to lead to a significant decrease in energy consumption in the coming years.

Sector companies contribute to Canada's overall energy efficiency and GHG-reduction programs in other ways. Many sector products, from oil-refinery control systems to high-efficiency motors and lighting, are used by companies in other sectors to decrease their energy consumption.

CHALLENGES

The energy management challenges faced by the electrical and electronics sector are largely the result of global economic factors and the subsequent decrease in the availability of investment capital for energy conservation projects. Around the world, prices are restrained by excess global manufacturing capacity, soft demand, weak job markets, low interest rates and productivity gains. A weak corporate profit picture inevitably leads to tighter capital investment controls, especially for spending on machinery and equipment. An end to the contraction trend in the sector may be close, but a full recovery is likely several months away.

Nevertheless, the electrical and electronics sector continues to lead other manufacturing sectors in decreasing its energy use and intensity. This positive trend is a result of productivity gains and greater efficiencies within manufacturing operations. In addition, the industry continues to focus its efforts on establishing new standards and increasing the energy efficiency of its products.

Electricity Generation

Profile *The electricity generation sector produces the electrical energy that powers industry, business and homes across Canada. Using water, fossil fuel, nuclear energy and alternative energy sources, the sector produced 539 TWh in 2000, meeting Canada's domestic energy needs while earning more than $1 billion in export revenues.*

Performance Highlights

- TransAlta Utilities Corporation has established a $100 million Sustainable Development Research and Investment Fund.
- BC Hydro Corporation plans to build a 20-MW green energy demonstration project for Vancouver Island.
- ATCO Electric has launched a new energy management service for its customers.
- New radiant heaters installed by Canadian Niagara Power Company Limited have led to an energy input reduction of 15 percent.
- Manitoba Hydro launched the Power Smart Eco-Efficiency Solutions Program to help industrial customers improve their energy efficiency and environmental performance.
- An 11-MW wind power generation project in Saskatchewan now provides half of the electricity used in Government of Canada facilities in that province.
- For the third consecutive year, TransAlta was listed on the Dow Jones Sustainability World Index.

The sector is currently working with NRCan's Office of Energy Efficiency to develop indices and figures.

ACTIONS

The industry continues to support the Canadian Electricity Association's (CEA's) Environmental Commitment and Responsibility (ECR) Program. The ECR Program was established in 1997 to report on environmental performance on a national, industry-wide basis. Participation in the ECR Program became a requirement of corporate utility CEA membership in 1998.

Individual electricity producers are taking significant steps toward energy efficiency and reducing the industry's impact on the environment. For example, Alberta's TransAlta Utilities Corporation has established a $100 million Sustainable Development Research and Investment Fund for investments in renewable energy, carbon-offset projects and the research and development of clean coal technology.

In June 2001, BC Hydro Corporation announced that it plans to build a 20-MW green energy demonstration project for Vancouver Island. The project will produce 10 MW of electricity from wind, 6 to 8 MW through micro-hydro and 3 to 4 MW from ocean waves.

ATCO Electric, in partnership with ATCO Gas, has launched a new energy management service. ATCO EnergySense is an innovative energy management hot-line and on-site evaluation service for residential, farm and commercial customers. Company advisors answer telephone inquiries, make on-site visits and arrange for cost-effective home energy management audits (through a partnership with NRCan's Office of Energy Efficiency). Customers can also visit the interactive ATCO EnergySense House, an on-line energy audit tool.

An energy audit by Ontario's Canadian Niagara Power Company Limited in 2000 identified opportunities for improving efficiency in the company's lighting and heating systems. The company replaced unit heaters in the service area garage with gas-fired tube heaters. The new heaters emit radiant heat, decreasing the amount of heated air lost when doors are opened and increasing heating effectiveness and occupant comfort. Installation of the new heaters has led to an energy input reduction of 15 percent.

In 2001, Manitoba Hydro launched the Power Smart Eco-Efficiency Solutions Program in partnership with NRCan, Environment Canada, National Research Council Canada and Manitoba Conservation. The pilot program will identify and help industrial customers to implement measures in order to improve their energy efficiency and environmental performance.

In April 2001, the province of Saskatchewan entered into an agreement with the Government of Canada, Enbridge Inc. and Suncor Energy Inc. to develop the $20 million Sunbridge Wind Power Project, located five kilometres southeast of Gull Lake, Saskatchewan. The 11-MW project, completed in 2002, provides half of the energy used by facilities owned and operated by the Government of Canada in Saskatchewan. A second Saskatchewan wind power project was scheduled for completion in 2002, thanks to financial commitments from the provincial government and SaskPower. The 5.3-MW project will enable SaskPower to offer EcoLogo-certified green power, which will meet or exceed all government and industry safety and performance standards for renewable energy.

For the third consecutive year, the Alberta energy company TransAlta was listed on the Dow Jones Sustainability World Index. Companies are selected for the index based on a rigorous assessment that includes evaluation of social and environmental factors and economic performance. TransAlta was one of only four North American power generation companies to be included in this index of the world's most sustainable companies. TransAlta has invested more than $23 million in renewable energy and distributed generation over the last two years. TransAlta is the first company in Calgary to have the electricity needs of its corporate headquarters met through wind generation.

ACHIEVEMENTS

The Canadian Electricity Association's *2001 ECR Annual Report*, published as part of the CEA's ECR Program, was distributed in October 2002. The report's theme is energy efficiency and focuses on demand and supply side energy management. The report is available on-line at www.canelect.ca/english/managing_issues_environment_ecr_library.html.

The sector's Electricity Metering Accuracy Program is helping to expand the use of electronic electricity meters. Electronic meters provide customers with real-time information on energy use and prevailing rates, enabling them to better manage their energy costs and usage patterns. For electric utilities, the meters will improve customer satisfaction, reduce operating costs, lower capital investment requirements in generation and infrastructure, and improve environmental performance.

CEA is currently undertaking a survey of energy efficiency programs in the electricity sector. The survey includes all programs aimed at reducing customer electricity demand and companies' efforts to reduce their own energy use. Initial results indicate that although the Canadian electricity industry continues to make sizable investments in energy efficiency programs, the scale and rationale for consumer energy management programs have changed due to the evolving nature of the industry.

CHALLENGES

Although the electricity generation sector is committed to taking action on energy efficiency, short-term gains are difficult to achieve. Improvements are achieved largely by replacing older, less efficient capital stock with new technology, a process that involves considerable planning and long turnover cycles. Although such programs deliver substantial, lasting effects, gains do not come quickly.

All efforts to increase energy efficiency must be balanced with the need to provide customers with reliable, affordable sources of energy. The demand for electricity is growing due to economic and population growth and structural factors such as changing production processes and consumer preferences. Rising demand will tax the imagination and resources of the electricity generation sector to find creative new ways to improve energy efficiency.

Fertilizer

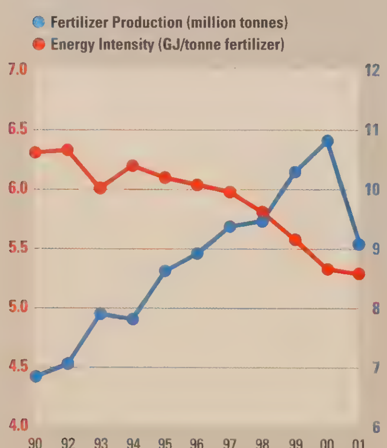
Profile *Canada's fertilizer industry is one of the world's major producers and exporters of nitrogen, potash and sulphur fertilizers, manufacturing 12 percent of the world's total fertilizer materials. Companies in this sector operate more than 30 production facilities and are among the world's most energy-efficient producers.*

Performance Highlights

- The Canadian industry is among the most energy efficient compared with its global competitors.
- In 2001, the Canadian Fertilizer Institute and NRCan initiated a benchmarking study of the fertilizer sector.
- Potash Corporation of Saskatchewan Inc.'s (PCS's) Cory Division will cut its energy consumption by using waste steam from an adjacent cogeneration project beginning in 2003.
- PCS is converting operations at its mine in Sussex, New Brunswick, from reliance on oil as a fuel source to natural gas.
- Agrium Inc. commissioned a cogeneration project at its Carseland Nitrogen Operations near Calgary, Alberta, in 2002.
- CF Industries Inc. made a number of energy efficiency improvements at its ammonia and urea production facilities in Medicine Hat, Alberta.
- The sector's fuel energy efficiency in the production of nitrogenous fertilizers has improved by about 16 percent over an 11-year period.
- Nitrogen fertilizer production in Canada increased from 6.8 million tonnes in 1990 to 9.0 million tonnes in 2001.

Fertilizer Sector – NAICS 325313 (nitrogenous)

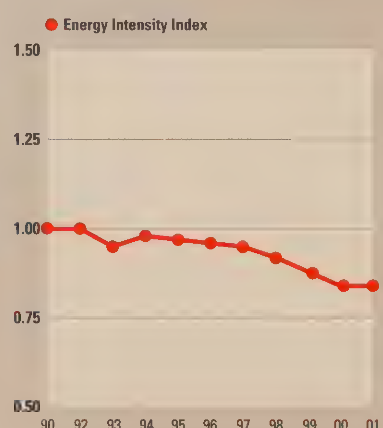
Energy Intensity and Physical Output (1990–2001)



Data source: Canadian Fertilizer Institute (CFI), January 2003.

Fertilizer Sector – NAICS 325313 (nitrogenous)

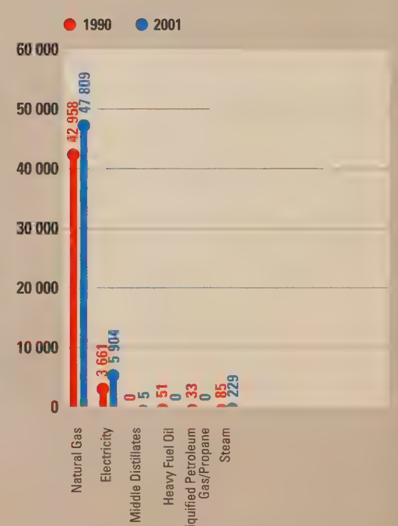
Energy Intensity Index (1990–2001)
Base Year 1990 = 1.00



Data source: Canadian Fertilizer Institute (CFI), January 2003.

Fertilizer Sector – NAICS 325313 (nitrogenous)

Energy Sources in Terajoules per Year (TJ/yr.)



Data source:
(1) Natural Gas: 1990–2001, CFI, January 2003.
(2) Other Fuels: 1990–2001. Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–2001*, December 20, 2002. Simon Fraser University.

ACTIONS

Under a contribution agreement with NRCan, the Canadian Fertilizer Institute (CFI) began the second phase of a benchmarking study of potash production in 2002. Final data collection and analysis is planned for early 2003. Benchmarking information will enable potash fertilizer producers to assess their energy efficiency performance against best-in-class operations and to identify areas where further improvements can be made. CFI plans to launch a similar benchmarking study of nitrogenous fertilizer production within the next year. To prepare for this initiative, CFI has already completed a study of CO_2 emissions from ammonia plants around the world and is now reviewing the results.

The year 2002 was the third and final year of CFI-funded research on the use of best management practices to minimize GHG emissions. Conducted in cooperation with the Natural Sciences and Engineering Research Council of Canada, the University of Manitoba and Agriculture and Agri-Food Canada, this research reflects CFI's commitment to stewardship throughout the life cycle of fertilizer products. The final report on this research will be available in the first half of 2003.

Also in 2001, CFI concluded a comprehensive study of carbon sequestration in agricultural soils under various regimes of fertilizer use and agricultural practices. A formal report was issued early in 2002.

Individual companies were also active contributors to the sector's energy efficiency efforts, including divisions of the Potash Corporation of Saskatchewan Inc. (PCS). At its Cory Division mine in Saskatchewan, PCS plans to draw waste steam from an adjacent power plant being constructed by Saskpower International Inc. and ATCO Ltd. PCS will use the steam in its crystallization process to produce potash. The cogeneration project will enable the Cory mine to mothball and eventually decommission an existing steam generation boiler plant, thereby significantly reducing CO_2 emissions. Steam from the project should be available to the Cory mine in the first half of 2003.

At the Sussex potash mine in New Brunswick, PCS is converting operations from reliance on oil as a fuel source to natural gas. Slated for completion in the first half of 2003, the conversion will result in a substantial reduction in the facility's CO_2 emissions.

A cogeneration project at Agrium Inc.'s Carseland Nitrogen Operations near Calgary, Alberta, was commissioned in early 2002. The facility, developed in a joint venture with TransCanada PipeLines Limited, is reducing the need for coal-generated electricity by using gas turbines to produce about 80 MW of electrical power for export into Alberta's power grid. The project will reduce GHG emissions by more than 300 000 tonnes of CO_2e annually.

CF Industries Inc. has made a number of energy efficiency improvements at the company's ammonia and urea production facilities in Medicine Hat, Alberta. Advances include establishing more efficient ammonia converter intervals and instituting de-bottlenecking and energy-use improvements, particularly in the low-pressure recovery and recycling area of CF's urea plant.

ACHIEVEMENTS

According to results of the Fertilizer Sector Task Force data-quality project, the sector's production of nitrogenous fertilizers increased from 6.8 million tonnes in 1990 to 9.0 million tonnes in 2001. The task force reports that the natural gas consumed as fuel in this production was 47 809 TJ in 2001 versus 42 958 TJ in 1990. This represents an improvement in fuel energy efficiency of approximately 16 percent over the 11-year period.

Based on CIEEDAC data, since 1990, potash production has increased some 18 percent, for a total of 8.2 kilotonnes in 2001. Although data reported to CFI by its members indicate greater production values, overall, energy indicators show an improvement in energy intensity that averages more than 1 percent per year since 1990.

CHALLENGES

The Canadian fertilizer industry is among the worldwide industry's lowest GHG emitters per unit of output. However, fertilizer manufacturing requires significant amounts of natural gas, both as a feedstock and as an energy source. As a result, the manufacturing and use of fertilizer produces GHG emissions, primarily CO_2. Conversely, the fertilizer industry plays an important role in carbon sequestration, helping to fix CO_2 in agricultural soils. The industry's products help to create agricultural sinks, which substantially offset the environmental impact of GHGs released during the manufacturing process. The industry believes that agricultural sinks could be a key component of a national short-term approach to reducing net national CO_2 emissions.

As a major energy consumer, Canada's fertilizer industry is concerned about the impact of Canada's Kyoto commitments. Despite the Canadian industry's international energy efficiency leadership, the introduction of climate change policy scenarios could put the industry at considerable risk. Keeping pace with growth in the worldwide demand for food will drive growth in fertilizer production and, consequently, the industry's energy consumption. Current and projected energy efficiencies cannot offset the impact of this growth, despite the industry's best efforts.

CFI believes that although gains in manufacturing energy efficiency will come in small increments, major reductions in the GHG impact of fertilizers can come from improvements in their use. The fertilizer industry supports research and other efforts that serve to improve the efficiency of fertilizer use and to foster best-practices approaches within Canada's agricultural community. The industry believes that the right mix of policies, practices and economic incentives could have a substantial impact on the global effort to reduce GHG emissions. Conversely, focusing solely on the energy used by Canada's fertilizer industry could inadvertently increase global GHG emissions and exacerbate the world's food shortages.

Food and Beverage

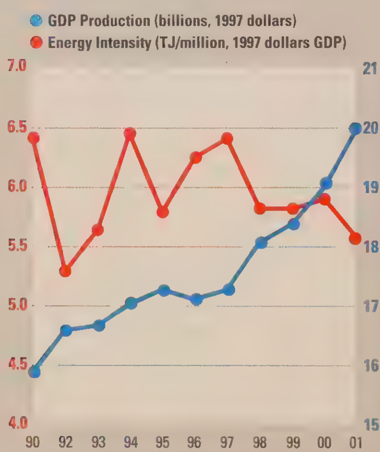
Profile *Canada's food and beverage sector includes manufacturers that produce a diverse range of products, including meat, dairy, poultry, fish/seafood, fruit and vegetables, bakery products, oils and sugars, coffee, snack foods, beer, soft drinks and confections.*

Performance Highlights

- Effem Inc., of Bolton, Ontario, has used NRCan's Industrial Energy Audit Incentive to identify a number of energy efficiency opportunities.
- Maple Leaf Foods Inc. and its family of companies signed on as Industrial Energy Innovators, adding 97 manufacturing plants to the program.
- Nestlé Canada Inc. conducted steam trap audits at three of its factories.
- Sakai Spice (Canada) Corporation has installed new power factor correction equipment.
- Sun Valley Foods, a division of Cargill Limited, installed a new roof that has a higher R-value at its facility in London, Ontario.
- At its facility in High River, Alberta, Cargill Foods, a division of Cargill Limited, installed an automated monitoring and control system on its cold-water pumps, reducing the number of pumps needed to maintain system pressure.
- Schneider Foods recently completed an energy audit of its facility in Kitchener, Ontario, that identified hundreds of thousands of dollars in potential savings.
- From 1990 to 2001, food processors improved their collective energy intensity by 13.3 percent.
- For the years 2000 to 2005, the sector anticipates an average reduction in energy use of 2.2 percent per year.

Food Sector – NAICS 311000; Beverage Sector – NAICS 312100[1]

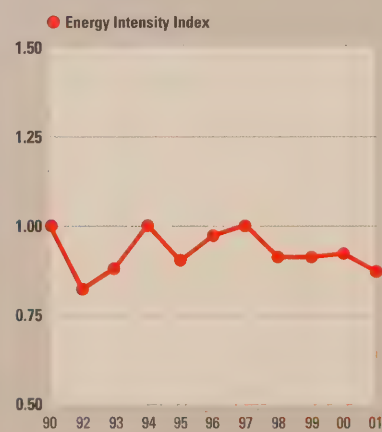
Energy Intensity and Economic Output (1990–2001)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–2001.* December 20, 2002. Simon Fraser University.
Note: Includes data for brewery and dairy sectors.

Food Sector – NAICS 311000; Beverage Sector – NAICS 312100[1]

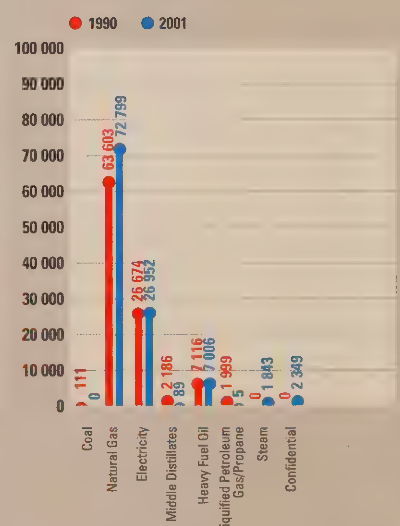
Energy Intensity Index (1990–2001) Base Year 1990 = 1.00



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–2001.* December 20, 2002. Simon Fraser University.
Note: Includes data for brewery and dairy sectors.

Food Sector – NAICS 311000; Beverage Sector – NAICS 312100[1]

Energy Sources in Terajoules per Year (TJ/yr.)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–2001.* December 20, 2002. Simon Fraser University.
Note: Includes data for brewery and dairy sectors.

[1] NAICS 311000: Food manufacturing includes dairy data. NAICS 312100: Beverage includes soft drinks, ice, breweries, wine and distilleries.

ACTIONS

The CIPEC Food and Beverage Sector Task Force meets three to four times a year, prior to CIPEC Task Force Council meetings. Task Force meetings in 2002 were hosted by Food and Consumer Products Manufacturers of Canada – a CIPEC partner since 1999 – and by Nestlé Canada Inc. at its manufacturing facility in Toronto, Ontario. Other sector partners include the Canadian Meat Council, the Baking Association of Canada, the Canadian Council of Grocery Distributors and the sector's newest partner, the Fisheries Council of Canada, which joined in 2001.

Individual food and beverage sector companies continue to take action to improve energy efficiency and minimize GHG emissions. A new Industrial Energy Innovator, Effem Inc. of Bolton, Ontario, has used NRCan's Energy Audit Incentive to identify a number of energy efficiency opportunities. The company will achieve energy savings through improvements to its compressed-air, vortex cooling and vacuum systems and through the use of skylights and improved lighting-control systems and practices.

Canada Bread Company Limited in Etobicoke, Ontario, a subsidiary of Maple Leaf Foods Inc., installed a Miniveil air-curtain system on a conveyor that opens to the facility's refrigerated palletizing room. The air curtain will reduce heat transfer at the opening and help keep the room at its required constant temperature of between 15°C and 21°C. In 2002, Maple Leaf Foods signed on as an Industrial Energy Innovator corporately, thereby making its 92 plants across Canada eligible to take advantage of the program's benefits. For example, Maple Leaf Consumer Foods held a customized "Dollars to $ense" energy management workshop and energy awareness day in Winnipeg for its Manitoba plants. The company's Canada Bread plants in Ontario participated in a daylong energy symposium in Hamilton. More customized workshops are planned for locations across Canada in 2003.

Nestlé Canada Inc. conducted steam trap audits at three of its factories, leading to efficiency improvements to its steam systems. The company has also continued its program of lighting upgrades and installed a wastewater treatment system.

Sakai Spice (Canada) Corporation's mustard processing plant in Lethbridge, Alberta, has made a number of energy efficiency improvements. The company has installed new power factor correction equipment, implemented an energy monitoring system and made improvements to its systems for refrigeration, compressed air, lighting and heating, ventilation and air conditioning. Sakai plans to launch new lighting initiatives and to make improvements to its plant's building envelope.

Sun Valley Foods, a division of Cargill Limited, completed a number of energy efficiency projects in 2001. The company replaced the roof of its facility in London, Ontario, with one that has a higher R-value, completed an audit and repair program on its compressed-air system and replaced light switches with lighting sensors in offices and locker rooms. In 2002, Sun Valley also conducted studies on power quality, power factor and refrigeration plant efficiency.

Cargill Foods, a division of Cargill Limited, in High River, Alberta, installed an automated monitoring and control system on its cold-water pumps, enabling the company to reduce the number of pumps needed to maintain system pressure from four to two. Off-line pumps are held in reserve to handle peak demand.

Schneider Foods recently completed an energy audit of its facility in Kitchener, Ontario. The audit found that modifications to the steam plant and reductions in the ventilation rate in the main plant will enable Schneider to reduce natural gas costs at the boiler plant by about $270,000 per year. These measures have an estimated payback time of less than one year and can reduce natural gas consumption by about 20 percent. Modifications to the refrigeration and ventilation systems could result in electricity and operating savings of approximately $465,000 per year. The modifications can reduce electricity use by 15 percent and would pay for themselves in about three years.

ACHIEVEMENTS

Canada's food processing industry continued to increase its gross output in 2001, but its energy use decreased slightly. The sector's total energy consumption declined to 111 043 TJ in 2001, compared with 111 736 TJ in 2000, a decrease of 0.6 percent. Over the past 11 years, the sector's total energy consumption increased by 9.2 percent, from 101 689 TJ in 1990 to 111 043 TJ in 2001, due largely to a significant increase in natural gas consumption. (These totals include energy use and output data from the dairy and brewery sectors, which are highlighted separately in this report.)

The sector's use of heavy fuel oil decreased by 16 percent over the past year. This reduction may be attributed to the leveling off or reduction in natural gas prices that occurred over the year. Although energy consumption within the sector has risen, the food industry has made long-term progress toward better energy efficiency. From 1990 to 2001, food processors improved their collective energy intensity by 13.3 percent.

CHALLENGES

Based on input from its member companies, the food and beverage sector has established aggressive targets for energy efficiency. For the years 2000 to 2005, the sector anticipates an average reduction in energy use of 2.2 percent per year. From 2006 to 2010, the sector's goal is an average reduction of 1.7 percent per year, for a total of 19.5 percent over the next 10 years.

Reaching these goals will not be easy. Many sector companies are concerned about the impact of Canada's commitment to the Kyoto Protocol and whether they will be able to meet the agreement's emissions requirements. Among their concerns are that the major changes in energy usage patterns needed to curb emissions will compromise product quality and may jeopardize their ability to meet legislated food safety regulations.

Sector members in Ontario are also concerned about immediate and medium-term electricity supply issues. Electrical cost uncertainties could lead these companies to re-examine cogeneration systems, which may result in increases in natural gas or heavy fuel oil consumption.

Foundry

Profile *Metal castings are the first step in the value-added manufacturing chain and are used in the manufacture of most durable goods. Markets and industries served by foundries include the automotive sector, construction, agriculture, forestry, mining, pulp and paper, heavy industrial machinery and equipment, aircraft and aerospace, plumbing, soil pipe, municipal, roads, defence, railways, petroleum and petrochemical, electrical distribution and a myriad of specialty markets. There are approximately 200 foundries in Canada, employing 15 000 people and generating annual sales of more than $2 billion. About 80 percent of the foundry sector's production is exported.*

Performance Highlights

- Canada's 200 foundries employ 15 000 people and generate annual sales of more than $2 billion.
- A "Dollars to $ense" workshop at Ancast Industries Ltd. has led to annual energy savings of $60,000 to $70,000.
- Bibby-Ste-Croix, in Sainte-Croix, Quebec, has established an energy efficiency committee to oversee the foundry's energy improvement strategy.
- ESCO Limited partnered with BC Hydro Corporation and NRCan in a cost-sharing initiative under BC Hydro's Power Smart program.
- NRCan's Office of Energy Efficiency and the Canadian Foundry Association launched a pilot foundry audit program with four foundries.
- Crowe Foundry Limited identified potential energy usage reductions of 22 percent and cost savings of 18 percent.
- Grenville Castings Limited identified opportunities to reduce energy consumption and energy costs by 5 percent.

The sector is currently working with NRCan's Office of Energy Efficiency to develop indices and figures.

ACTIONS

Individual foundries continued to take action to advance their energy efficiency programs on their own and in partnership with the Canadian Foundry Association and NRCan's Office of Energy Efficiency. For example, a "Dollars to $ense" workshop at Ancast Industries Ltd. of Winnipeg, Manitoba, has led to annual energy savings of $60,000 to $70,000 and stimulated further energy efficiency initiatives at the Winnipeg foundry. Ancast Industries expects to save $80,000 per year by implementing a three-phase, $200,000 project to recover heat from its three coreless induction furnace cooling systems. The company is currently compiling a list of all its potential energy-saving projects, including replacing inefficient lighting, cutting compressed-air requirements, reducing motor horsepower requirements and shutting down unneeded equipment during peak production periods.

Bibby-Ste-Croix, in Sainte-Croix, Quebec, established an energy efficiency committee to oversee the foundry's energy improvement strategy. The foundry also set up a new, energy-efficient melting department, improving the efficiency of furnace usage from 75 to 95 percent. The company installed a power supply control system that automates operations in all modes, from melt to hold, sinter and cold start. This system will save about 10 percent in electricity consumption. The foundry also installed automatic controls for its charging system.

ESCO Limited of Port Coquitlam, British Columbia, partnered with BC Hydro Corporation and NRCan in a cost-sharing initiative under BC Hydro's Power Smart program. The foundry identified energy efficiency opportunities in the operation and design of its cleaning room dust collector systems, welding booths and connecting ducts. Upgrading these systems will significantly reduce the horsepower required to run them, saving about 852 650 kWh per year. The foundry is also improving its compressed-air system by eliminating air leaks, shutting down compressors during non-production periods, adding a high-flow valve and reducing operating pressure by 7 percent. These measures are expected to save ESCO 560 750 kWh per year. In total, the cost-sharing initiative will enable the company to achieve a payback period of slightly more than one year.

NRCan's Office of Energy Efficiency and the Canadian Foundry Association launched a pilot foundry audit program with four foundries participating: ESCO Limited, Wabi Iron & Steel Corp., Crowe Foundry Limited and Grenville Castings Limited.

Under the audit program, Crowe Foundry Limited of Cambridge, Ontario, identified potential energy use reductions of 22 percent and cost savings of 18 percent through process heat recovery; improvements to heating, ventilation and compressed-air systems; and by establishing an energy monitoring and targeting program.

At its plants in Smiths Falls, Perth and Merrickville, Ontario, Grenville Castings Limited identified opportunities to reduce energy consumption and energy costs by 5 percent by implementing low-cost energy activities. These included changes in compressed-air end-use practices, improving process combustion system efficiencies and changes in equipment schedules.

ACHIEVEMENTS

Motivated by environmental and bottom-line concerns, Canada's foundries continue to implement energy efficiency improvements and reduce GHG emissions. Many companies no longer use GHG-generating fuels such as coal, oil or coke in their operations and have eliminated the use of steam produced by coal-generated electricity.

Escalating oil, natural gas and electricity costs are leading a growing number of companies to adopt active programs throughout the industry, including installing equipment that is more efficient, implementing improved methods and establishing fuel-switching and waste-energy capture programs. These actions are bolstering the sector's efforts to improve its energy efficiency.

CHALLENGES

Canada's foundries continue to search for and adopt energy-efficient equipment and methods. More than ever, foundries are closely monitoring energy consumption and implementing programs to improve energy efficiency. Efforts are complicated by the sector's growing business complexity – many sector companies now go far beyond raw castings and design parts, build tooling, cast prototypes and make, machine and assemble castings and sub-assemblies. By necessity, the industry's expanded role has led to increased upward pressures on energy consumption.

Many foundries, especially in Ontario, are concerned by electricity prices and electrical distribution charges. Although changes in the energy market affect all facilities to some extent, foundries that rely more heavily on electricity are hurt more than those that rely on other fuels. The Canadian Foundry Association is concerned that higher energy costs will endanger the position of Canadian foundries in the highly competitive international marketplace.

General Manufacturing

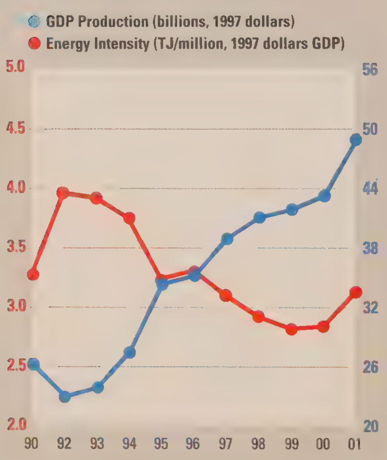
Profile *The general manufacturing sector comprises a variety of industries, including leather, clothing, furniture, printing activities, construction materials, floor coverings, insulation, glass and glass products, adhesives, plastics and pharmaceuticals. The sector encompasses approximately 2000 small, medium and large companies that, combined, consumed 152 679 TJ of energy in 2001.*

Performance Highlights

- Simmons Canada Inc. reports a company-wide decrease in natural gas use in 2001 of 121 869 cubic metres, or 13.8 percent.
- North American Felt installed a heat exchanger in its incinerator chimney, enabling the company to use the previously wasted heat to generate steam.
- Interface Flooring Systems (Canada) Ltd. saved about $400,000 over a six- to eight-month period through energy conservation measures.
- Sintra Inc. installed automatic temperature control systems at its offices in Québec, Sherbrooke and Joliette.
- EMCO Limited has completed the installation of two new high-efficiency boilers at its plant in La Salle, Quebec, reducing the plant's natural gas consumption by 7.5 percent.
- Husky Injection Molding Systems Ltd.'s GHG emissions in 2001 were 15 percent below 1990 levels, despite the company tripling in size over the same period.

General Manufacturing[1]

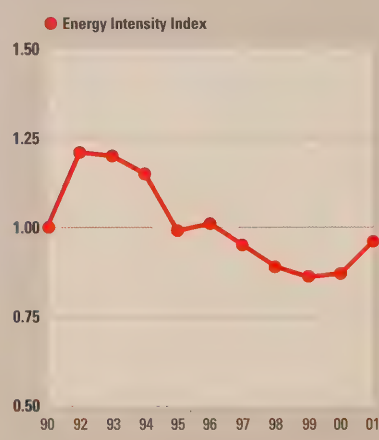
Energy Intensity and Economic Output (1990–2001)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–2001.* December 20, 2002. Simon Fraser University.

General Manufacturing[1]

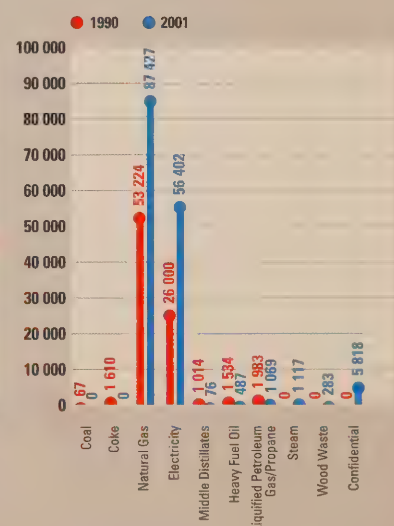
Energy Intensity Index (1990–2001) Base Year 1990 = 1.00



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–2001.* December 20, 2002. Simon Fraser University.

General Manufacturing[1]

Energy Sources in Terajoules per Year (TJ/yr.)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–2001.* December 20, 2002. Simon Fraser University.

[1]
NAICS 315	Clothing and Manufacturing
NAICS 316	Leather and Allied Products
NAICS 323	Printing and Related Support Activities
NAICS 3254	Pharmaceutical and Medicine
NAICS 3255	Paint Coating and Adhesive Manufacturing
NAICS 3256	Soap, Cleaning Compound and Toilet Preparation
NAICS 3259	Other Chemical Products Manufacturing
NAICS 3261	Plastic Products Manufacturing
NAICS 327210	Glass and Glass Products Manufacturing
NAICS 332	Fabricated Metal Products
NAICS 333	Machinery
NAICS 337	Furniture and Related Products
NAICS 339	Miscellaneous Manufacturing

ACTIONS

Across the country, individual sector members, represented by the Eastern, Central and Western General Manufacturing Sector Task Forces, are making important contributions to energy efficiency. For example, Simmons Canada Inc., based in Mississauga, Ontario, has made significant gains in energy efficiency by consolidating its production in the prairie provinces, implementing new procedures for using gas heaters and air make-up units, and by upgrading its lighting systems. Simmons reports a company-wide decrease in its natural gas use in 2001 of 121 869 cubic metres, or 13.8 percent, while its electricity consumption increased by only 0.1 percent. Simmons has targeted an additional improvement of 2 percent in 2002.

The energy efficiency team at Owens Corning Canada Inc.'s Scarborough plant in Toronto, Ontario, continues to find ways to keep its operations running with less energy. The plant eliminated compressed-air use in key areas and lowered pressure in its compressed-air system from 115 psi to 106 psi while producing the same output. The team also made modifications to the plant's oven/incinerator process. Combined, these actions have produced energy savings of $45,000 per month. At its plant in Edmonton, Alberta, Owens Corning is converting its lift trucks from propane to natural gas, saving the company an estimated $20,000 per year in energy costs.

At its plant in Joliette, Quebec, North American Felt installed a heat exchanger in its incinerator chimney, enabling the company to use the previously wasted heat to generate steam. The company also installed insulation on the incinerator piping system, preserving fume heat and reducing natural gas consumption.

Interface Flooring Systems (Canada) Ltd. will save about $400,000 over a six- to eight-month period through energy conservation measures. The total conversion of Interface's electricity supplies to green sources in the coming years will net annual savings of about $400,000.

The paving company Sintra Inc. installed automatic temperature-control systems at its regional offices in Québec, Sherbrooke and Joliette that reduce heating and air-conditioning demand (and thus energy consumption) when the buildings are unoccupied. A similar system will be installed at its headquarters in Montréal in 2003.

EMCO Limited has completed the installation of two new high-efficiency boilers at its plant in La Salle, Quebec, reducing the plant's natural gas consumption by 7.5 percent. System optimization of its boilers is expected to improve its boiler room energy consumption by an additional 2 percent in 2003. At EMCO's plant in Pont-Rouge, Quebec, the company has reduced energy consumption by converting its main dryer from steam to natural gas. At its plant in Edmonton, Alberta, EMCO modified various gas-fired burners and reviewed the electrical specifications for all its equipment to ensure that correctly sized motors were in place. The company also eliminated non-essential equipment. Edmonton achieved its greatest gains by enclosing its paper mill effluent output, thereby reducing the energy required to heat incoming process water.

Husky Injection Molding Systems Ltd. of Bolton, Ontario, continues to be a leader in environmental management practices. In 2001, the company's GHG emissions were 15 percent below 1990 levels, despite the company tripling in size over the same period. The company has achieved these results by including energy efficiency in all of its business decisions – using the latest construction technology to improve the energy efficiency of its facilities, purchasing the most fuel-efficient vehicles, using video conferencing instead of air travel and taking a host of other actions. Husky expects to completely eliminate its net CO_2e emissions and become GHG neutral by 2010.

ACHIEVEMENTS

The three General Manufacturing Sector Task Forces, which each meet three to four times a year, continue to make progress in meeting the commitments outlined in their current action plan. The task forces are currently revising the sector's action plan for the period 2003–2006. The task forces have established and are maintaining ongoing collaborative efforts with manufacturing, technology and energy organizations that are interested in furthering industrial energy conservation and efficiency. Moreover, the growing regional task forces in western and eastern Canada continue to extend CIPEC's reach to manufacturers nationwide. Across the country, the sector is encouraging the involvement of other associations and firms and stimulating the reporting of energy efficiency progress by the sector's Industrial Energy Innovators.

CHALLENGES

The General Manufacturing Sector Task Forces cover an extremely broad range of industries that comprise companies of all sizes. This diversity makes it a challenge to develop comprehensive, accurate, sector-wide energy data.

Moreover, the implementation of energy efficiency programs is an uphill battle for many sector companies. Where energy is a large component of overall costs, many manufacturers, especially smaller ones, lack the knowledge and financial resources to identify and act on energy-saving opportunities. For companies that are less energy intensive, the relatively small role that energy plays in overall costs makes it difficult to justify major capital expenditures. For companies of all sizes, finding the staff and capital resources to dedicate to energy projects is a significant impediment. Furthermore, as many companies restructure to lower costs and reduce staffing, the competition for resources has pushed energy efficiency improvement programs to the back burner.

These challenges are exacerbated by wide fluctuations in energy prices, which make it difficult to build a classical business case for investments in energy efficiency.

Lime

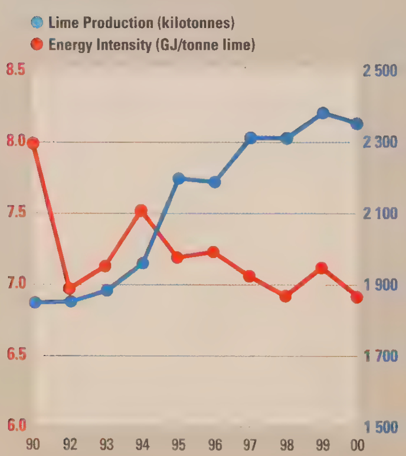
Profile *Canada's merchant lime sector supplies essential raw materials for steel production, mining, pulp and paper manufacturing, water treatment, environmental management and other basic industries. Operating 15 facilities and employing more than 700 people, the sector's four companies and their affiliates had a combined lime-calcining capacity of approximately 3 million tonnes in 2001.*

Performance Highlights

- In 2001, the lime sector had a combined lime-calcining annual capacity of approximately 3 million tonnes.
- The sector co-sponsored a customized energy workshop for Canadian lime producers in June 2002.
- Chemical Lime Company of Canada Inc. held a customized energy workshop in western Canada in January 2003.
- Graymont (QC) Inc. commissioned an energy-efficient short rotary kiln at its facility in Bedford, Quebec.
- While the sector's total energy consumption increased by 1491 TJ between 1990 and 2000, the sector's energy intensity index decreased by 13.5 percent.
- Companies representing nearly 99 percent of the lime-production capacity in Canada's merchant lime sector are now Industrial Energy Innovators.

Lime Sector – NAICS 327410

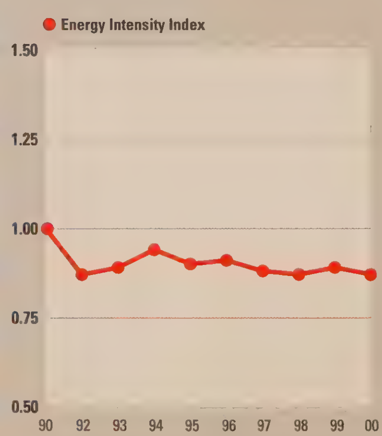
Energy Intensity and Physical Output (1990–2000)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry 1990–2001.* March 11, 2003. Simon Fraser University.

Lime Sector – NAICS 327410

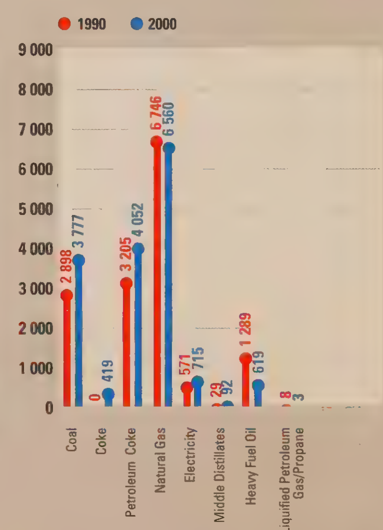
Energy Intensity Index (1990–2000)
Base Year 1990 = 1.00



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry 1990–2001.* March 11, 2003. Simon Fraser University.

Lime Sector – NAICS 327410

Energy Sources in Terajoules per Year (TJ/yr.)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry 1990–2001.* March 11, 2003. Simon Fraser University.

ACTIONS

In June 2002, the Canadian Lime Institute, in conjunction with NRCan's Office of Energy Efficiency, co-sponsored a customized energy workshop for Canadian lime producers. Carmeuse Lime (Beachville) Ltd. hosted the workshop at its facility in Ingersoll, Ontario. All but one member company of the Canadian Lime Institute was represented at the event, which drew 22 participants that ranged from energy managers, mechanics and operators to accounting personnel, senior executives, plant managers, superintendents and supervisors. Chemical Lime Company of Canada Inc. held a similar customized energy workshop in January 2003. The event, held at the Chemical Lime Company's plant in Langley, British Columbia, attracted 29 participants.

Individual lime manufacturers continue to make significant energy efficiency improvements. For example, Graymont (QC) Inc. commissioned an energy-efficient short rotary kiln at its facility in Bedford, Quebec. The kiln, which includes a process preheater, is rated at 550 tonnes of production per day.

ACHIEVEMENTS

Companies in the merchant lime sector represented by the Canadian Lime Institute continue to work actively to improve the energy efficiency of their operations. Within the sector, Industrial Energy Innovators account for close to 99 percent of Canada's lime-production capacity.

Accurate energy consumption and efficiency data for 2001 were not available as of this writing. However, in 2000, it took 16 237 TJ of energy to produce 2351 kilotonnes of lime. This compares with 16 937 TJ and 2381 kilotonnes in 1999, and 14 746 TJ and 1848 kilotonnes in 1990. Energy consumption per tonne of lime decreased from 7.11 GJ per tonne in 1999 to 6.91 GJ in 2000, a 3 percent improvement. While total energy consumption increased by 1491 TJ between 1990 and 2000, the sector's energy intensity index decreased by 13.5 percent. The sector is committed to continuing improvement in its energy intensity at a target rate of 0.3 to 0.5 percent per year.

Only about 40 percent of the GHGs emitted by the lime sector relate to the consumption of energy to prepare limestone for calcination and to convert it into finished products. The remaining 60 percent emerges from the calcination or decomposition of limestone. The sector's GHG emissions are offset to some extent by the re-absorption of CO_2 by lime during its life cycle. The National Lime Association estimates that more than 25 percent of the lime produced in Canada and the United States re-absorbs CO_2 either in process or naturally.

CHALLENGES

In an industry that depends heavily on combustion fuels, rising fuel prices make energy efficiency a top priority. Although ongoing refinements continue to be made to existing calcining equipment, substantial capital investments in new, more efficient kiln installations are needed to realize major gains. Although these investments are important to the industry's competitiveness and energy efficiency, a recent weakened demand for the industry's product has increased the challenge facing lime producers to find the needed capital.

Producers are also challenged to balance energy efficiency with quality. The production of lime occurs at high temperatures, using large quantities of combustion fuel. Natural gas is the sector's principal fuel source, with petroleum, coke and coal making up most of the balance. Fuel switching and high-efficiency large-kiln technology may reduce energy requirements, but they can also interfere with product quality, a significant concern for some of the sector's largest customers.

Mining

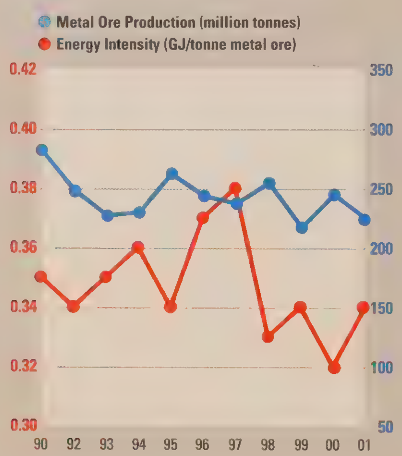
Profile *Canada's minerals and metals industry produces 60 different mineral commodities. At the end of 2001, there were 71 metal mines and 26 non-ferrous metal smelters and refineries (excluding aluminum) located across the country. The mining and minerals processing industry directly employs 375 000 people and contributed $35 billion to Canada's GDP in 2001 – 3.75 percent of the national total. Canada is one of the world's largest mineral exporters, with 80 percent of its production – valued at $47.4 billion – destined for foreign markets. This represents 13.8 percent of total domestic exports, or $1 for every $8 earned in Canada through exporting. Despite an overall decline in mineral prices in recent years, mineral and metal exports increased by 63 percent between 1993 and 2001.*

Performance Highlights

- Canada is one of the world's largest mineral exporters, with 80 percent of its production – valued at $47.4 billion – destined for foreign markets.
- In 2001, the Mining Association of Canada (MAC) received a VCR Inc. Association Leadership Award of Canada's Climate Change Voluntary Challenge and Registry Inc. (VCR Inc.) for its voluntary progress in reducing energy consumption and GHG emissions across Canada's mining and metals industry.
- MAC has completed energy benchmarking studies on underground bulk and open-pit mining operations.
- MAC's Task Force on Energy hosted its second energy efficiency conference in November 2002.
- Falconbridge Limited's Canadian divisions implemented energy conservation projects that reduced energy consumption by 13.8 GWh in 2001.
- Inco Limited implemented 88 projects under its Energy Breakthrough program, resulting in savings of 1331 TJ and emissions reductions of more than 61 kilotonnes of CO_2e.
- MAC members have agreed to extend the sector's annual energy intensity reduction target of 1 percent to 2005.

Metal Ore Mining Sector – NAICS 212200

Energy Intensity and Physical Output (1990–2001)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–2001.* December 20, 2002. Simon Fraser University.

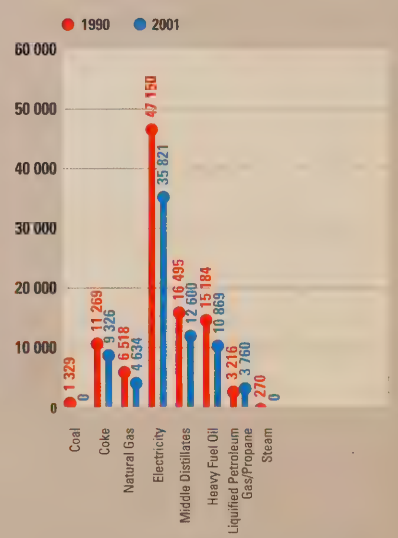
Metal Ore Mining Sector – NAICS 212200

Energy Intensity Index (1990–2001) Base Year 1990 = 1.00

Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–2001.* December 20, 2002. Simon Fraser University.

Metal Ore Mining Sector – NAICS 212200

Energy Sources in Terajoules per Year (TJ/yr.)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–2001.* December 20, 2002. Simon Fraser University.

ACTIONS

Through the Mining Association of Canada (MAC), members of the mining industry are firmly committed to improving energy efficiency and participating in a solution to climate change. As part of their commitment to GHG reduction, 16 of MAC's 26 members (62 percent of total membership), representing most of energy consumption in the metal mining sector, are participating in Canada's Climate Change Voluntary Challenge and Registry Inc. (VCR Inc.). MAC continues to encourage member and non-member companies to report progress annually. In 2001, MAC achieved VCR Inc.'s Gold Level Champion reporting status and was awarded VCR Inc.'s Association Leadership Award for voluntary progress for its success in helping to reduce energy consumption and GHG emissions across Canada's mining and metals industry.

To encourage greater member participation, MAC voluntarily reports the GHG emissions of its members in its annual *Environmental Progress Report*. In 2001, the second year of this report, nine member companies provided data for public reporting on their energy consumption and on their direct and indirect GHG emissions.

To help companies develop and implement effective energy efficiency programs across the Canadian mining industry, MAC's Task Force on Energy hosted its second annual Energy Efficiency Conference in Calgary, Alberta, in November 2002. The session, which was designed for managers involved in energy efficiency, production, financial analysis, environmental issues and long-term cost-efficiency planning, included a workshop that helped attendees identify business opportunities available through improved energy efficiency.

To measure and compare energy performance within the industry, MAC, with the assistance of NRCan's Office of Energy Efficiency, has performed energy benchmarking studies on underground bulk and open-pit mining operations. A third benchmarking study that will focus on non-ferrous smelting and refining is being planned. These studies have provided valuable information for measuring an organization's energy performance and have helped identify where improvements and better practices can be adopted.

Within the industry, individual companies are seizing opportunities to improve energy efficiency. For example, at its smelter in Sudbury, Ontario, Falconbridge Limited is installing furnace-peak, paste-heater and automation controls. At its Sudbury mine, the company is turning down its principal mine ventilation system and reducing shaft air temperatures. At its Raglan operation, in northern Quebec, Falconbridge is rationalizing remote generators and concentrator compressed-air systems and is optimizing underground heating. At its Kidd Creek facilities in Timmins, Ontario, the company is introducing process improvements to reduce natural gas use and is making improvements to its zinc plant cell-house and to its systems for compressed air, mine ventilation and electrical metering. In 2001, Falconbridge's Canadian divisions implemented energy conservation projects that reduced energy consumption by 13.8 GWh. By maintaining its focus on energy efficiency, the company's Canadian divisions have improved their energy intensity by 9.31 percent and reduced their carbon intensity by 6.36 percent since 1990.

Inco Limited's Energy Breakthrough (EB) program has become the focal point of the company's energy efficiency and climate change mitigation efforts. During the program's first full year of operation in 2001, Inco expanded it to include additional operations, including the company's copper and nickel refineries. Over 12 months, Inco implemented 88 EB projects, resulting in audited energy savings of 1331 TJ and emissions reductions of more than 61 kilotonnes of CO_2e. In Inco's Ontario operations alone, EB projects produced energy savings of \$13.5 million, well above the company's \$12 million target. Inco's EB program is supported by the company's PowerPlay awareness campaign that links individual action, energy efficiency and climate change mitigation. PowerPlay encourages employees to identify energy-saving projects that can be integrated into the EB tracking system. During the program's pilot phase, employees offered 650 suggestions. The top 60 projects were implemented, resulting in annual energy savings of just under \$10 million.

ACHIEVEMENTS

In 2001, total energy used in metal mining was 77 012 TJ compared with 79 054 TJ in 2000. Over the period 1990–2001, energy consumption in metal mining decreased by 24 percent, while energy intensity, or energy consumed per unit of metal concentrate, improved by 3 percent. For the period 1990–2000, metal mining decreased its total GHG emissions by 19.2 percent and improved overall GHG intensity by 18.5 percent.

MAC member companies have agreed that the target of 1 percent annual reduction in energy consumption per unit of output, originally intended to run from 1995 to 2000, will be extended to 2005.

CHALLENGES

MAC believes that when considering the mining industry's role in meeting Canada's Kyoto commitments, it is vital that the Government of Canada develop an implementation plan that fully respects the trade and competitiveness implications of ratification for all Canadians. What is needed is a clear-eyed assessment of Canada's ability to meet the Kyoto target and the consequences of doing so. As has been the case in the past, MAC will fully support the development of this implementation plan, but the process must not halt immediate action in limiting the GHG emissions that contribute to climate change. MAC members want to be part of the solution and accept that prudent precautionary measures are necessary for a healthy environment and a healthy economy.

MAC supports the development of balanced climate change policies that achieve the following:

- efficiently improve environment quality and deliver sustainable and predictable environmental, social and economic policies over the long term
- encourage and support early action by industry to reduce GHG emissions
- build on voluntary measures by industry
- maximize flexibility to minimize costs
- examine emissions embodied in trade
- encourage investment in better energy-efficient processes and the cost-effective replacement of capital stock
- recognize and encourage the growth of domestic industry
- support a productive and competitive economy
- maximize investment certainty for business

Energy costs for Canada's mining sector represent a significant component of the total cost of operations, and mining companies have made energy efficiency a top priority. Companies have employed new technology and results-based energy audits to boost energy efficiency, reduce emissions and improve competitiveness. Although the limits of technology and the net cost of further reducing GHG emissions are significant barriers, many financially attractive opportunities still exist for improving energy efficiency and reducing costs.

Oil Sands

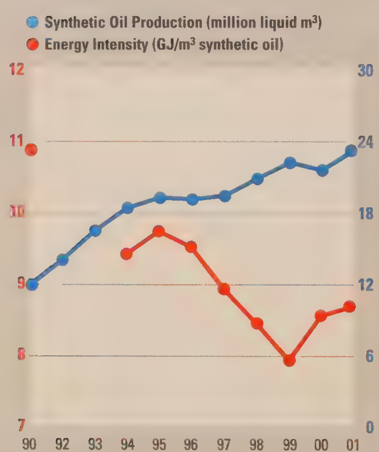
Profile *Canada's oil sands sector includes two plants in northern Alberta and one heavy oil upgrader in Saskatchewan. Together, these facilities produce more than 400 000 barrels of crude oil per day for markets in Canada and the United States. The sector is a major employer and a significant contributor to Canada's GDP.*

Performance Highlights

- The oil sands sector is committed to ongoing improvements in energy efficiency through a combination of operational excellence and technological innovation.
- Initiatives launched by Suncor Energy Inc.'s oil sands operations have reduced its GHG emissions in 2001 by 2 million tonnes of CO_2e compared with 1990.
- Syncrude Canada Ltd. continues to pursue "Syncrude 21," its 11-year strategic capital investment program begun in 1997.
- The Athabasca Oil Sands Project is committed to reducing its GHG emissions by 50 percent by 2010.
- Using a life-cycle value assessment process, Petro-Canada was able to reduce projected GHG emissions from its new MacKay River oil sands project by approximately 15 percent.
- In 2001, energy consumed per unit of production was 8.68 GJ/m^3, a total improvement of 20 percent since 1990.

Oil Sands Sector – NAICS 211114

Energy Intensity (1990, 1994–2001) and Physical Output (1990–2001)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–2001.* December 20, 2002. Simon Fraser University.

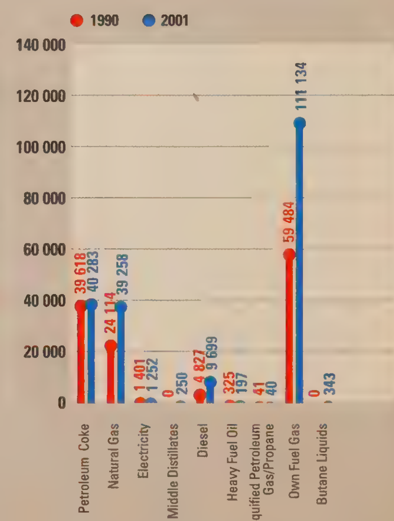
Oil Sands Sector – NAICS 211114

Energy Intensity Index (1990, 1994–2001) Base Year 1990 = 1.00

Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–2001.* December 20, 2002. Simon Fraser University.

Oil Sands Sector – NAICS 211114

Energy Sources in Terajoules per Year (TJ/yr.)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–2001.* December 20, 2002. Simon Fraser University.

ACTIONS

Ongoing technological innovation and a commitment to operational excellence continue to help the oil sands sector make substantial improvements in energy efficiency. Plants are improving the reliability of their operations and introducing programs to recover waste heat and boost yields through more efficient processing. Other gains are coming from the introduction of new technologies in the mining and extraction stages.

In 2001, Suncor Energy Inc. – Oil Sands began construction of the Firebag Oil Sands Project north of Fort McMurray, Alberta. Firebag is designed to use steam-assisted gravity-drainage (SAGD) technology to reach deep bitumen deposits with less impact to the air, water and land than traditional mining methods. Suncor has improved its extraction process by implementing a new steam turbine generator that uses waste heat from the oil sands upgrader in the extraction process while generating electrical power. In addition, TransAlta Energy Corporation began operating a new cogeneration facility on the Suncor plant site in the summer of 2001. Initiatives launched by the company's oil sands operations have reduced its 2001 GHG emissions by 2 million tonnes of CO_2e compared with 1990. Suncor estimates that planned internal operating initiatives, including new technologies, new products, energy efficiency projects and energy chargebacks, should lower its GHG emissions by more than 6 million tonnes of CO_2e by 2005.

Syncrude Canada Ltd. continues to pursue "Syncrude 21," its 11-year strategic capital investment program begun in 1997. The four-stage project is upgrading oil sands operations and improving energy efficiency. Syncrude 21 and predecessor activities have had a significant impact on the company's energy efficiency and, subsequently, on GHG emissions. Although the company plans to increase annual crude production by 95 million barrels between 1988 and 2012, Syncrude has targeted a one-third total improvement in energy use and CO_2 emissions per barrel over that period. This represents a 25 percent reduction compared with 1990. The company will achieve these improvements by shifting to less energy intensive mining and extraction methods, upgrading its technology and implementing process improvements.

The Athabasca Oil Sands Project (AOSP) met its commitment in March 2001 to estimate GHG emissions resulting from the construction phase of the project. A full report on these emissions is scheduled for completion in early 2003. As an offset to its GHG emissions, the AOSP joint-venture partners engaged the Tree Canada Foundation to plant 160 000 trees. The project is committed to a best-practices approach to environmental management, and AOSP is committed to reducing its GHG emissions by 50 percent by 2010 through a combination of energy efficiency measures, purchased and partner-generated offsets and clean development mechanism projects in conjunction with international partners.

Petro-Canada began construction of an in-situ oil sands development at MacKay River, near Fort McMurray, Alberta, in late 2000. Before launching the oil sands venture, Petro-Canada instituted a life-cycle value assessment analysis process. Using this process, Petro-Canada was able to incorporate improvements in its design process that reduced projected GHG emissions by approximately 15 percent. The project will use SAGD technology to produce 30 000 barrels of oil per day. This technology will enable Petro-Canada to produce from previously inaccessible resources and do so with significantly less surface impact than traditional oil sands mining. To minimize GHG emissions at the site, the project will use a cogeneration power plant to produce steam and electricity for its operations and provide surplus electricity to the power grid. The cogeneration project will reduce GHG emissions from the oil sands plant by 50 percent.

ACHIEVEMENTS

In 2001, the oil sands sector continued to make steady progress toward energy efficiency. Energy consumed per unit of production rose slightly to 8.68 GJ/m^3, compared with 8.55 GJ/m^3 in 2000. Although total annual production rose 95 percent since 1990, energy use rose only 56 percent. In 2001, the sector's energy consumption totalled 202 455 TJ, and its energy intensity has improved a total of 20 percent since 1990. This compares favourably with the sector's target of a 1 percent minimum average improvement in energy efficiency per unit of production per year.

CHALLENGES

The oil sands industry's challenges continue to be both technological and financial. To further improve energy efficiency, sector companies must continue to combine investment in innovative technologies with operational excellence. They must continue to develop and implement better, less energy intensive extraction methods and modify material-handling systems to efficiently accommodate ever-increasing production. Due to the massive scale required for oil sands production, these activities tax the industry's financial capabilities and human resources. The long lead times and substantial investments required to introduce enhancements continue to force difficult choices on the industry and limit the sector's progress toward greater energy efficiency.

Petroleum Products

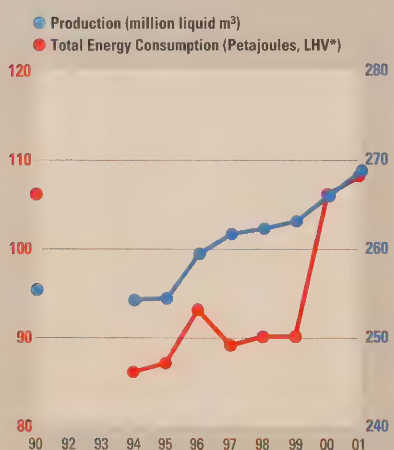
Profile *Canada's petroleum products sector markets gasoline, diesel, heating oil, jet fuels, lubricating oil, grease, food-grade white oils, asphalts and aromatic hydrocarbons through a network of more than 15 000 wholesale and retail outlets nationwide. Operating 21 oil refineries across the country, the industry provides direct employment for 100 000 Canadians and generates an estimated 100 000 indirect jobs.*

Performance Highlights

- The industry operates 21 oil refineries across the country and provides 200 000 direct and indirect jobs.
- The Canadian Petroleum Products Institute and NRCan's Office of Energy Efficiency initiated a successful anti-idling pilot project in Mississauga, Ontario.
- Imperial Oil Limited plans to install a $120 million, 90-megawatt natural-gas-fired cogeneration facility at its refinery in Sarnia, Ontario.
- In 2001, Petro-Canada refineries cut more than 36.6 kilotonnes from their annual GHG emissions and saved more than 667 000 GJ of energy.
- Suncor Energy Inc. reduced its marketing and refining GHG emissions in 2001 by 6.3 percent compared with 2000.
- Shell Canada Products Limited improved its energy efficiency by more than 2 percent in 2001.
- In 2001, the sector's energy intensity index stood at 94.2 – 16.6 percent better than in 1990.

Petroleum Products – NAICS 324110

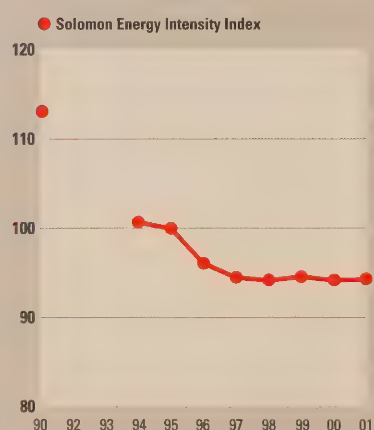
Production and Energy Consumption (1990, 1994–2001)



Data source: *Review of Energy Consumption in Canadian Oil Refineries and Upgraders: 1990 to 2001.* Prepared for the Canadian Petroleum Products Institute and the Canadian Industry Program for Energy Conservation by John Nyboer. Canadian Industrial Energy and End-Use Data Analysis Centre, December 2002, Simon Fraser University.

Petroleum Products – NAICS 324110

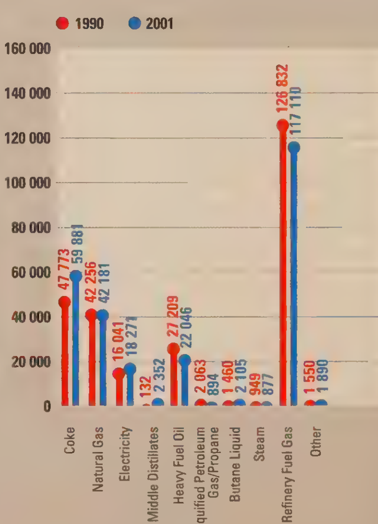
Solomon Energy Intensity Index (1990, 1994–2001) Base Year (1990) = 113



Data source: *Review of Energy Consumption in Canadian Oil Refineries and Upgraders: 1990 to 2001.* Prepared for the Canadian Petroleum Products Institute and the Canadian Industry Program for Energy Conservation by John Nyboer. Canadian Industrial Energy and End-Use Data Analysis Centre, December 2002, Simon Fraser University.

Petroleum Products – NAICS 324110

Energy Sources in Terajoules per Year (TJ/yr.)



Data source: *Review of Energy Consumption in Canadian Oil Refineries and Upgraders: 1990 to 2001.* Prepared for the Canadian Petroleum Products Institute and the Canadian Industry Program for Energy Conservation by John Nyboer. Canadian Industrial Energy and End-Use Data Analysis Centre, December 2002, Simon Fraser University.

* LHV (lower heating value) does not include the latent heat of the water vapour (steam) generated as a result of combustion.

ACTIONS

A pilot project jointly initiated and funded by the Canadian Petroleum Products Institute (CPPI) and NRCan's Office of Energy Efficiency helped to raise public awareness of how small, day-to-day choices can have a significant environmental impact. An anti-idling campaign, conducted in fall 2001 in Mississauga, Ontario, involved more than 50 service stations from five gasoline retail chains. Designed to encourage motorists to reduce unnecessary vehicle idling, the highly successful pilot generated a wealth of data to help shape similar programs in the future.

Individually, Canadian refiners continue to invest in capital projects and make improvements to their operations to reduce the refining sector's energy intensity index by 1 percent per year through to 2005. For example, Imperial Oil Limited plans to install a $120 million, 90-megawatt natural-gas-fired cogeneration facility at its refinery in Sarnia, Ontario, that will produce about 75 percent of the site's electricity requirements. Although this will slightly add to the company's total emissions, it will offset the use of power from more carbon-intensive sources and reduce overall GHG emissions by as much as 500 kilotonnes per year. Imperial Oil reports that GHG emissions from its downstream operations were 2.7 percent lower in 2001 than in the previous year because of a lower carbon fuel mix, less flaring and slightly lower production.

In 2001, process improvements at its refineries in Montréal, Quebec, and Mississauga, Ontario, enabled Petro-Canada to cut more than 36.6 kilotonnes from its annual GHG emissions and save more than 667 000 GJ of energy. Projects planned for and underway at its four refineries will produce additional reductions of 2.5 million GJ of energy and 130.7 kilotonnes of GHG emissions by 2005. Since 1990, Petro-Canada's company-wide actions have reduced annual GHG emissions by more than 1.2 million tonnes.

The comprehensive Energy Management System at Suncor Energy Inc. is contributing to energy efficiency and reduced GHG emissions. The company has installed a box cooler control at its refinery in Sarnia to reduce steam consumption. Work is now complete on minimizing inefficient operating conditions by increasing the response rate to process variables from 14 times per week to every two hours. The overall energy improvement from 1990 to 2001 has averaged 0.6 percent per year, as measured by the energy formula from the Solomon Energy Intensity Index. Overall, Suncor's 2001 marketing and refining GHG emissions were 6.3 percent below 2000 levels. The company will purchase steam and electricity from the Sarnia Regional Cogeneration Plant, thereby reducing emissions by an annual 174.6 kilotonnes of CO_2e.

Following a trend established in the early 1990s, Shell Canada Products Limited improved its energy efficiency by more than 2 percent in 2001. At its refinery in Scotford, Alberta, Shell is considering projects that will reduce net GHG emissions by 135 kilotonnes, with a further 165-kilotonne reduction possible by purchasing cogenerated power. At its refineries in Sarnia and Montréal, the company is investing $150 million to install gasoline hydrotreaters, which will reduce sulphur levels in gasoline to meet upcoming Government of Canada standards of 30 parts per million. Modifications to the hydrotreater design will enable Shell to reduce anticipated fuel consumption and reduce GHG emissions from the new equipment by 20 percent. Shell's planned energy improvement capital investments, totalling $50 million between 2001 and 2005, are expected to reduce GHG emissions by 300 kilotonnes.

ACHIEVEMENTS

Since the 1990 base year, the sector's total energy consumption has increased slightly by 0.5 percent to 267 638 TJ; production over the same period increased by 14 percent. In 2001, the sector's energy intensity index stood at 94.2, basically the same as in 2000 and 16.6 percent better than in 1990. The sector utilizes the Solomon Energy Intensity Index because it is an international standard that dates back to 1990, is well documented and has been the basis for CPPI member commitments.

In 2001, production of petroleum products increased by 2.7 percent while energy consumption increased by 0.5 percent, or 1459 TJ, compared with 2000.

CHALLENGES

The sector will be challenged in the next several years to continue to reduce energy consumption. Meeting lower sulphur-content standards for gasoline and diesel fuel will require the industry to invest an estimated $1.8 billion in capital improvements. These improvements in fuel quality, combined with new engine systems in vehicles, will lead to an estimated 90 percent reduction in tailpipe emissions of key smog-forming gases (NO_x, SO_x and volatile organic compounds). Paradoxically, the production of low-sulphur fuel will require methods and processes that are more energy intensive, thereby making it more difficult and expensive for refineries to reduce their own CO_2 emissions.

Although the industry has made sizable capital investments and re-engineered its practices to reduce energy intensity, continued development of innovative energy efficiency projects will be needed in order for the industry to maintain its continuous improvement trend.

Pulp and Paper

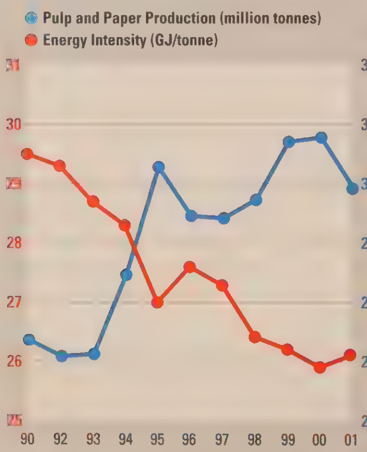
Profile *Pulp and paper, a key component of the forest products industry, is a major contributor to Canada's economy. Besides market pulp, the sector includes the newsprint, specialty papers, paperboard, building board and other paper sub-sectors.*

Performance Highlights

- Canada's pulp and paper facilities have reduced their GHG emissions by 26 percent since 1990 through energy improvements, fuel switching and energy conservation projects, even though production increased by 21 percent.
- Fifty-seven percent of the pulp and paper industry's energy needs now come from renewable biomass energy.
- Tembec Paper Group – Pine Falls Operations has completed a number of GHG-reduction initiatives at its newsprint mill in Manitoba.
- Stora Enso North America's Port Hawkesbury Mill expects to record a 37.2 percent reduction in total direct fossil-fuel-source GHG emissions by 2005.
- Alberta-Pacific Forest Industries Inc.'s direct and indirect GHG emissions in 2001 were 50 percent below 1994 benchmark levels.
- Energy-reduction and fossil-fuel-substitution activities at Domtar Inc. have led to substantial gains in energy efficiency.

Pulp and Paper Sector – NAICS 322100

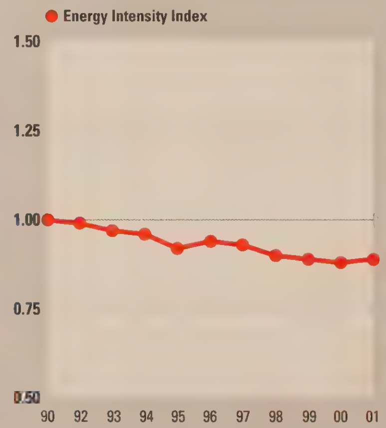
Energy Intensity and Physical Output (1990–2001)



Data source: *Energy Monitoring Report, 1990–2001*, Forest Products Association of Canada (formerly the Canadian Pulp and Paper Association).

Pulp and Paper Sector – NAICS 322100

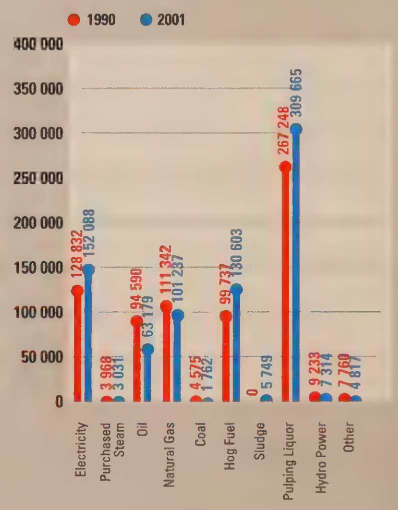
Energy Intensity Index (1990–2001) Base Year 1990 = 1.00



Data source: *Energy Monitoring Report, 1990–2001*, Forest Products Association of Canada (formerly the Canadian Pulp and Paper Association).

Pulp and Paper Sector – NAICS 322100

Energy Sources in Terajoules per Year (TJ/yr.)



Data source: *Energy Monitoring Report, 1990–2001*, Forest Products Association of Canada (formerly the Canadian Pulp and Paper Association).

ACTIONS

Pulp and paper companies continue to improve energy intensity and implement programs to reduce the use of fossil fuels. For example, Tembec Paper Group – Pine Falls Operations has completed a number of initiatives to reduce GHG emissions at its Manitoba newsprint mill complex. Since 1998, the company has used solids (sludge) from its wastewater treatment system as biomass fuel for its boilers, thereby reducing its reliance on coal. In March 2001, the company commissioned a new, $124 million thermo-mechanical pulp mill that incorporates a sophisticated heat recovery unit. Excess heat generated by the new mill is harnessed to produce steam, enabling Tembec to further reduce its coal consumption. As a result of these and other actions, the company's GHG emissions for fiscal year 2001 were 17 percent below 1990 levels. Tembec is now working toward launching a proposed joint venture sawmill in partnership with 11 First Nations community businesses to provide additional biomass fuel (bark) as part of its coal-replacement efforts at its newsprint mill.

Stora Enso North America – Port Hawkesbury Mill of Nova Scotia expects to see a 37.2 percent reduction in its total direct fossil-fuel-source GHG emissions and a 63.4 percent reduction in specific emissions per tonne of production over 1990 levels by 2005. These improvements will come from displacing heavy oil with natural gas and from energy-saving projects. Gas was first delivered to the mill in July 2001 and is being used to replace heavy oil as boiler fuel. The mill's specific emissions for 2001 were 23.5 percent below 1990 levels and were running 52.0 percent below 1990 levels in the first 10 months of 2002.

Alberta-Pacific Forest Industries Inc. (Al-Pac) of Boyle, Alberta, is Canada's newest and North America's largest single-line kraft pulp mill. The mill was designed to be almost self-sufficient in terms of energy through its use of wood-waste and black-liquor energy sources to produce process steam and electricity. Today the mill generates 84 percent of its own energy requirements. Al-Pac's direct and indirect GHG emissions in 2001 amounted to 0.23 tonne of CO_2e per air-dried tonne of pulp production, a decrease of 50 percent since 1994, the mill's first year of production. Al-Pac's absolute mill GHG emissions have dropped from 215 343 tonnes of CO_2e in 1994 to 137 593 tonnes in 2001, a decrease of 36.1 percent despite increased pulp production. The sale of Al-Pac–generated surplus power to the Alberta Interconnected Electric System and a company-created forest sequestration sink should position Al-Pac as a net carbon sink rather than a net emitter. The company's surplus power sales will offset GHG emissions by 25 766 tonnes of CO_2e per year in the Alberta power grid, and the forest sequestration project will make Al-Pac a net carbon sink of 561 029 tonnes of CO_2e per year by 2024.

Energy-reduction and fossil-fuel-substitution activities at Domtar Inc. have led to substantial gains in energy efficiency. In 2000, although production at Domtar's pulp and paper operations increased by 32.4 percent compared with 1990, total GHG emissions from fossil fuels per tonne of product decreased by 23.4 percent. The company expects to further reduce GHG emissions by promoting continuous improvement activities, installing equipment that is more energy efficient, maximizing the use of resources such as waste, improving efficiency and increasing the use of biomass fuels.

The industry has also taken action on energy efficiency through its associations and institutes. For example, the Forest Engineering Research Institute of Canada (FERIC), in collaboration with NRCan's Office of Energy Efficiency, launched its SmartDriver program for forestry trucks in 2001. The program provides advice on safe, fuel-efficient driving techniques and guidance on selecting vehicle components to reduce fuel consumption. FERIC's "star trucks" initiative, developed in partnership with Tembec Inc., made further advances in 2001 by providing an increased payload capacity and reduced idling time. These activities enable fleets to reduce hauling costs and GHG emissions by more than 10 percent.

ACHIEVEMENTS

Over the past decade, the pulp and paper industry has made steady progress toward improving its energy efficiency. For the period 1990–2001, the pulp and paper industry improved its energy consumption per tonne of output by 11.4 percent. The sector decreased its total energy consumption per tonne of pulp and paper from 29.5 GJ in 1990 to 26.1 GJ in 2001. Over the same period, the consumption of fossil fuel and electricity (excluding biomass) decreased from 14.7 GJ per tonne to 11.2 GJ per tonne.

The industry's ongoing focus on biomass energy sources has enabled pulp and paper companies to reduce their use of less environmentally friendly fossil-fuel sources, despite growing production. Fifty-seven percent of the industry's energy needs are now met by turning wastes into renewable fuels. Over the same period, the industry's use of heavy fuel oil has been reduced by 33.2 percent. Thanks to this trend, it took 11.4 percent less energy to produce a tonne of pulp and paper in 2001 than it did in 1990. Expressed in terms of GHG emissions, the sector emitted 38 percent fewer GHGs to produce a tonne of pulp and paper in 2001 than it did in 1990.

CHALLENGES

The rapid climb of fossil-fuel prices is providing significant impetus to pulp and paper companies to improve their fuel efficiency and use more biomass fuel sources. The switch to biomass will help the sector achieve additional reductions in energy intensity. At the same time, international disputes, production curtailments and other factors have resulted in a reduction in total biomass availability. Although this decline exists in most areas of Canada, there is still a significant amount produced annually and that is available for energy use.

Rubber

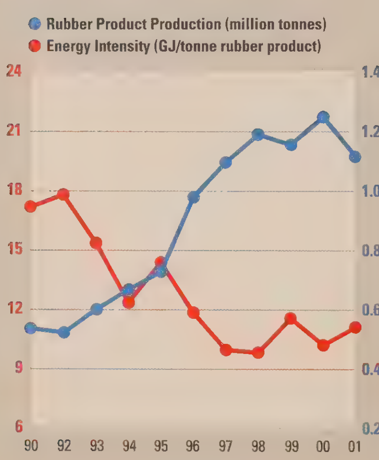
Profile *The rubber products sector comprises establishments that are engaged in manufacturing tires and tubes, automotive parts, rubber hoses and belting, mechanical rubber goods and a wide variety of other products such as rubber and plastic weatherstripping, pressure-sensitive tape, rubber gloves, rubber mats, rubber household products and tire-retreading materials. To meet demand for its products, the rubber products industry employs just over 26 000 people in some 240 facilities nationwide, providing a total payroll of more than $700 million annually.*

Performance Highlights

- The Rubber Association of Canada (RAC) sponsored an energy efficiency workshop customized for the rubber industry on November 20, 2002.
- The tire industry is continuing its efforts to promote the use of energy-saving wide-base tires within the trucking industry.
- The RAC has signed an agreement with NRCan to further develop its education campaign on tires, "Be Tire Smart – Play Your Part."
- Goodyear Canada Inc. is using SOLARWALL® technology at its plant in Napanee, Ontario.
- NRI Industries Inc. has completed the installation of a second continuous curing press at its plant in Toronto, Ontario.

Rubber Sector – NAICS 326200

Energy Intensity and Physical Output (1990–2001)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry 1990–2001.* December 20, 2002. Simon Fraser University.

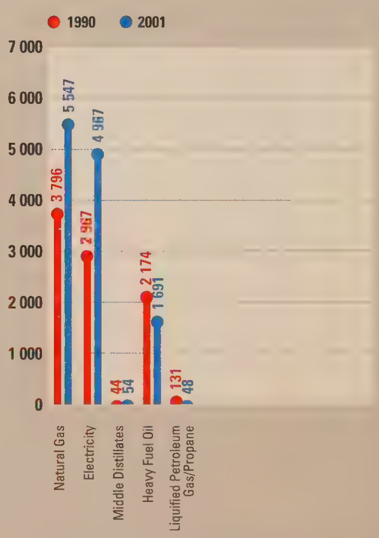
Rubber Sector – NAICS 326200

Energy Intensity Index (1990–2001)
Base Year 1990 = 1.00

Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry 1990–2001.* December 20, 2002. Simon Fraser University.

Rubber Sector – NAICS 326200

Energy Sources in Terajoules per Year (TJ/yr.)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry 1990–2001.* December 20, 2002. Simon Fraser University.

ACTIONS

The rubber industry continues to take the initiative in improving its energy efficiency. For example, on November 20, 2002, the Rubber Association of Canada (RAC) sponsored an energy efficiency workshop that was customized for the rubber industry and conducted in partnership with NRCan's Office of Energy Efficiency. The workshop looked at how energy is used and lost in rubber products facilities and how to incorporate energy savings within management objectives. The workshop was well received and has created a demand for follow-up workshops among sector companies.

The tire industry is continuing its efforts to promote the use of energy-saving wide-base tires within the trucking industry. With wide-base tires, fewer tires are needed, thereby reducing energy-wasting sidewall friction and improving fuel economy by approximately 5 percent. This provides economic benefits to trucking fleets as well as relief for the environment.

The RAC has signed an agreement with NRCan to further develop its education campaign on tires, "Be Tire Smart – Play Your Part." The first phase of the expanded program includes gathering information through a national survey of tire inflation. The survey will obtain information on 1800 motorists in six locations across Canada to determine their current knowledge, attitudes and practices regarding their vehicle tire maintenance. In addition, technical data such as vehicle identification number, tire size, tire pressure and tread depth will be collected for each vehicle.

Individual RAC member firms have also taken action to improve energy efficiency. For example, Goodyear Canada Inc. is using SOLARWALL® technology to advance ISO 14000 continuous improvement objectives at its facility in Napanee, Ontario. Completed in late 2002, the $76,500 project is expected to result in annual natural gas savings of more than 600 GJ, with an associated GHG reduction of more than 30 tonnes per year. The system saves additional energy by recapturing heat lost through the building's walls and by reducing air stratification and exhaust heat loss. Goodyear expects that the installation will reduce natural gas costs to heat the area it supplies by about 80 percent.

NRI Industries Inc. of Toronto, Ontario, has taken numerous steps to improve energy efficiency. The company uses motion sensors in each office to turn off lights when the space is not in use, uses high-efficiency equipment such as steam boilers and motors, and has installed improved building and machinery insulation. Recently installed high-efficiency boilers are expected to reduce natural gas use at the company's plant in Mississauga, Ontario, by 43.4 percent and at its Toronto plant by 27.2 percent. NRI has completed the installation of a second continuous curing press at the Toronto plant and is converting several inefficient batch operations to more efficient continuous processes. The company is also capturing heat from its boilers for use as building heat.

ACHIEVEMENTS

Based on sample data collected by the RAC for 2001, total production of the rubber products sector was 1 111 950 tonnes, with a value of approximately $6.76 billion, up from 531 961 tonnes and $3.31 billion in 1990. Most of the Canadian industry's total shipments were exports, with more than 95 percent of these going to the United States. In absolute terms, energy consumption for the rubber products industry increased between 1990 and 2000, rising from 9115 TJ in 1990 to 12 309 TJ in 2001. However, the sector's gross output increased at a higher rate, leading to a significant decline in energy intensity over the same period.

CHALLENGES

The rubber industry faces a number of issues that affect the sector's efforts to improve energy efficiency, among them the Kyoto Protocol, rising energy costs and increasing foreign competition. Canada's signing of the Kyoto Protocol has created a great deal of uncertainty for rubber manufacturers. There is no specific policy program yet identified, and the industry has deep concerns that unless there is significant industry consultation in its creation, upcoming policies may be unworkable. In addition, rising energy prices, accelerated by international uncertainties, are putting serious pressures on manufacturers. Although higher prices provide a strong incentive to invest in energy efficiency in the longer term, weak international markets and intensifying foreign competition will make it difficult to find the capital to make these investments.

Domestic rubber manufacturers are concerned about the rising influx of low-cost offshore product from emerging industrial countries such as China. An industry trade journal recently reported that the U.S. Department of Transportation received requests for paperwork to import tires from dozens of Chinese tire plants alone. Canadian manufacturers will be forced to compete with imports from these low-labour-cost producers and may find it impossible to allocate additional resources to energy efficiency.

Steel

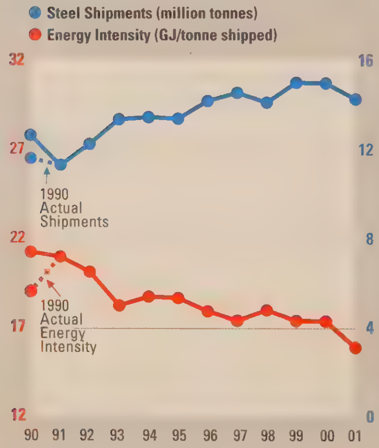
Profile *Canada's steel sector is one of the country's largest industries, generating annual sales of more than $11 billion, including more than $3 billion in exports. The companies that make up the steel sector supply flat-rolled (sheet and plate), long (re-bar and structural steel) and specialty and alloy (stainless and tool steels) products for major markets in the automotive, appliance, oil and gas, machinery, construction and packaging industries. The Canadian steel sector comprises 16 plants that directly employ 34 500 workers in five provinces.*

Performance Highlights

- Algoma Steel Inc. reduced its GHG emissions by 7.9 percent through adjustments to its fuel mix and improved facility efficiency.
- Recent energy-saving measures taken by Gerdau AmeriSteel Corporation's facility in Cambridge, Ontario, are saving the company more than 1.2 million kWh of electricity annually, or $55,000 per year.
- Ongoing energy efficiency efforts at Dofasco Inc. have improved its energy consumption by 17.6 percent since 1990.
- Stelco Inc. companies have achieved an aggregate 20 percent reduction in specific energy consumption and CO_2 intensity.
- The steel sector's energy intensity performance improved significantly, from 17.29 GJ per tonne in 2000 to 15.81 in 2001.

Steel Sector – NAICS 331100

Energy Intensity and Physical Output (1990–2001)



Data source: Energy: Statistics Canada. *Quarterly Report on Energy Supply and Demand (QRESD).* December 2002. Data source: Shipments: Statistics Canada. *Catalogue 41-001, Primary Iron and Steel.*

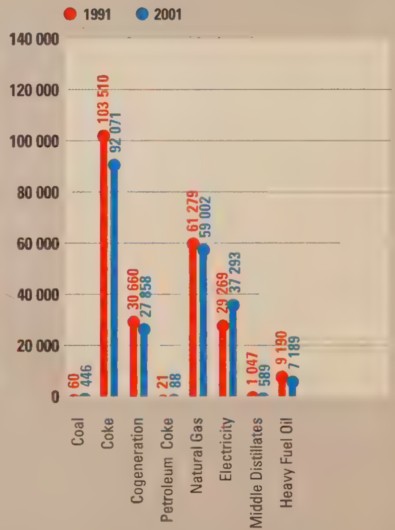
Steel Sector – NAICS 331100

Energy Intensity Index (1990–2001) Base Year 1990 (adjusted) = 1.00

Data source: Energy: Statistics Canada. *Quarterly Report on Energy Supply and Demand (QRESD).* December 2002. Data source: Shipments: Statistics Canada. *Catalogue 41-001, Primary Iron and Steel.*

Steel Sector – NAICS 331100

Energy Sources in Terajoules per Year (TJ/yr.)



Data source: Energy: Statistics Canada. *Quarterly Report on Energy Supply and Demand (QRESD).* December 2002.

ACTIONS

Canadian steelmakers continued to invest in programs that improve energy efficiency as part of efforts to upgrade productivity and quality while reducing costs.

Algoma Steel Inc. completed a project for one of its plate heat treat furnaces at its mill in Sault Ste. Marie, Ontario, that reduced natural gas consumption by 0.8 million BTU per tonne of steel processed. The project lowered costs and improved product quality while reducing emissions by nearly 20 000 tonnes of CO_2 per year. Algoma is implementing a networked energy (power) monitoring system to track the company's entire power consumption grid and to help plan future power reductions. From 2000 to 2001, Algoma reduced its GHG emissions by 7.9 percent through adjustments to its fuel mix and improved facility efficiency.

Gerdau AmeriSteel Corporation's facility in Cambridge, Ontario, established energy conservation teams at its melt shop and rolling mill to identify and implement energy-reduction measures. Recent energy initiatives include installing a timer to automatically shut down the bag house during off-use periods, adjusting the fume exhaust system of the ladle baking station to limit operation to periods when it is required, and automatically shutting down pumps when the mill is down. These measures are saving the company more than 1.2 million kWh of electricity annually, or $55,000 per year.

Dofasco Inc. undertook a pilot audit of energy and utilities savings at its Tin Products Business Unit. A cross-function team at the company's facilities in Hamilton, Ontario, identified energy and utilities savings opportunities of about 10 percent per year. The pilot audit will be extended to two other business units in 2002. The company's Steelmaking Business Unit improved its ladle metallurgy control, power profile and burner tuning on the electric arc furnace vessel, leading to energy savings of 33 500 GJ per year. The Utilities Business Unit reduced pilot fuel consumption in its boilers, freeing up fuel to displace purchased fuel used elsewhere in the plant. Combined activities in 2001 resulted in a 0.32 percent improvement in the total plant energy rate and produced annualized energy savings of 204 000 GJ. Dofasco's specific energy consumption has improved 17.6 percent from 1990 to 2001.

Throughout 2001, the Stelco Inc. group of companies, comprising two divisions and seven wholly owned subsidiaries, achieved an aggregate 20 percent improvement in specific energy consumption (GJ per tonne shipped) and CO_2 intensity (tonne of CO_2 produced per tonne of product shipped) compared with the 1990 base year. Annual CO_2 emissions from direct and indirect sources totalled 7.3 million tonnes – a reduction of 12 percent, or 1 million tonnes, from the 1990 base year.

- Stelco subsidiary Lake Erie Steel Company, in Nanticoke, Ontario, upgraded controls and installed high-performance discharge doors on its two original furnaces, thereby reducing heat loss and energy requirements for its hot strip mill reheating furnaces. The company also converted the primary cooler pump in its coke ovens from electric to steam drive, using steam produced with blast furnace gas to reduce electric power consumption. Lake Erie Steel has improved its overall energy efficiency by 32 percent relative to the 1990 base year.
- At AltaSteel Ltd., a Stelco division, in Edmonton, Alberta, a computerized preventive maintenance program continues to improve energy efficiency by minimizing operating delays. The company replaced an electro-mechanical tilting system for its melting furnace with a hydraulic system, thereby enhancing product process control and improving quality and yield.
- Stelco Inc.'s Hilton Works in Hamilton, Ontario, continued to make energy efficiency improvements in 2001, despite market-driven production cutbacks and the idling of one of its two blast furnaces. Hilton lowered specific energy consumption by almost 1 percent relative to its 1989 base year, reducing annual CO_2 emissions by more than 33 000 tonnes. These gains were the result of actions such as re-evaluating heating requirements at its hot strip mill to reduce steam use, coke-oven battery optimization, furnace stockline control and tuyère improvements to reduce furnace fuel rates, and air-fuel ratio improvements in its rod mill reheat furnace.
- Stelco McMaster Ltée improved the bar mill reheat furnace at its facility in Contrecoeur, Quebec, reducing specific energy consumption by 4.1 percent between 1999 and 2002. Improvements to the eccentric bottom tapping furnace oxy-burners and ladle preheating reduced natural gas consumption by 26 percent. A new, 16-stand in-line bar mill enabled the company to save 11.6 percent in electrical energy per tonne of steel produced. In 2001, specific energy consumption at Stelco McMaster improved 10 percent over its 1989 base year.

ACHIEVEMENTS

The Canadian steel industry produced 16.7 million tonnes of steel and shipped 15.7 million tonnes in 2001. The sector's energy intensity performance improved significantly, from 17.29 GJ per tonne in 2000 to 15.81 in 2001. Since 1990, the sector has improved its aggregated energy performance by more than 25 percent. This represents an average annual improvement of 2.27 percent, surpassing the industry's commitment to an average improvement of 1 percent per year for the period.

CHALLENGES

Through voluntary efforts, the steel sector has reduced GHGs to well below the Kyoto Protocol target, but because the Government of Canada does not provide credit for early action, the industry faces higher costs. In addition, imports of low-priced steel continue to be a major threat to the profitability and stability of the Canadian steel sector. For Canadian steelmakers to be competitive, government must put in place effective measures to counter unfairly traded imports, address global steel over-capacity, and deal with trade-distorting practices by foreign governments.

Canada's tax system remains uncompetitive with the United States, our major trading partner. Moreover, research into the development of new energy efficiency technologies by Canadian steel producers, when conducted outside of Canada or through international collaboration and partnerships, does not fully benefit from the Government of Canada's Scientific Research and Experimental Development Program. Such international efforts are common in industries that are as capital intensive and internationally based as the steel industry.

Textiles

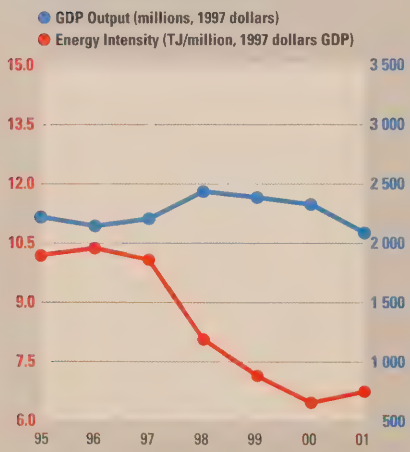
Profile *Canada's textile industry produces the fibres, yarns, fabrics and textile articles purchased by users and customers as diverse as automotive manufacturing, clothing, construction, environmental protection, road building and retail. The industry exports just under half of its production.*

Performance Highlights

- In 2001, the industry's GDP output was 6 percent lower than in 1995, while its energy consumption decreased by 38 percent.
- Agmont Inc. is studying opportunities to reduce its use of natural gas by installing a solar water heating system.
- Lincoln Fabrics Ltd. conducted an energy audit to identify energy efficiency opportunities.
- Beaulieu Canada Company introduced a program to systematically gather and analyse energy data at its plants.
- Doubletex Inc. instituted a number of energy efficiency projects throughout its operations.
- DuPont Canada Inc.'s performance contracting program is helping to make significant reductions in the company's energy consumption.

Textiles Sector – NAICS 313, 314*[1]

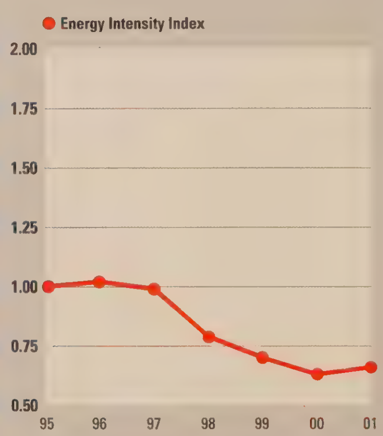
Energy Intensity and Economic Output (1995–2001)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–2001.* December 20, 2002. Simon Fraser University.

Textiles Sector – NAICS 313, 314*[1]

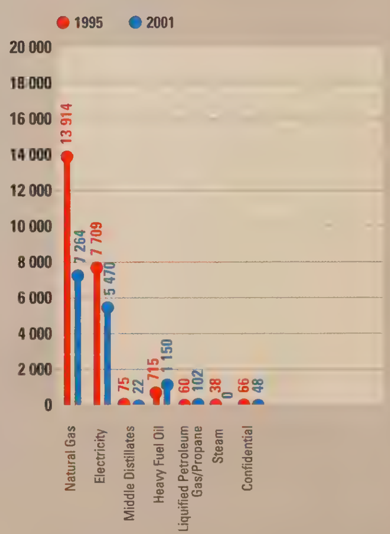
Energy Intensity Index (1995–2001) Base Year 1995 = 1.00



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–2001.* December 20, 2002. Simon Fraser University.

Textiles Sector – NAICS 313, 314*[1]

Energy Sources in Terajoules per Year (TJ/yr.)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–2001.* December 20, 2002. Simon Fraser University.

[1] Sum of all NAICS 313 Textile Mills and NAICS 314 Textiles Products Mills

ACTIONS

Throughout the textiles sector, companies are benefiting from more efficient uses of energy. J.L. de Ball Canada Inc. of Granby, Quebec, has introduced programs to recover and re-use heat from washing machine water, improve tenter frame energy performance by installing new controls to modulate exhaust fans and temperature, and conduct energy surveys at all locations in its plant to identify energy conservation opportunities.

Consoltex Inc., with headquarters in Saint-Laurent, Quebec, and four manufacturing plants in Quebec and Ontario, remains committed to active efforts to improve energy efficiency. The company is carrying on with its steam trap improvement program, refitting its lighting systems with metal halide fixtures and pursuing opportunities to recycle process water. Consoltex is making strong progress toward a targeted 10 percent reduction in energy use per unit of production through to 2005.

Agmont Inc. of Montréal, Quebec, is conducting lighting retrofit and employee energy awareness programs and is studying opportunities to reduce its use of natural gas by installing a solar water heating system.

Lincoln Fabrics Ltd. of St. Catharines, Ontario, conducted an energy audit to identify energy efficiency opportunities. The company also upgraded its looms and implemented a program to detect and repair air leaks in order to improve the performance of its compressed-air system.

Beaulieu Canada Company of Acton Vale, Quebec, introduced a program to systematically gather and analyse energy data at its plants in Ontario and Quebec. The company is also planning to conduct energy audits.

Doubletex Inc., with plants in Montréal, Quebec, and Toronto, Ontario, installed a water-effluent heat recovery system, improved piping insulation, introduced a heat recovery program for its washing lines and launched an upgraded steam trap maintenance program. Doubletex is also studying opportunities to reduce energy consumption by using solar water heating.

DuPont Canada Inc. continues to implement its performance contracting program. The company's facility in Maitland, Ontario, started the company's first project under this program in October 2001. The project is now saving about 45 000 pounds per hour of steam, or more than 10 percent of the total steam used at the site. Three other projects, worth a total of more than $8 million, are under construction at the company's plant in Kingston, Ontario.

Through NRCan's Office of Energy Efficiency, the Canadian Textiles Institute and CIPEC have jointly agreed to conduct a benchmarking study in the wet-processing segment of the textile industry. Wet processing is one of the industry's more energy intensive activities, and most companies employ similar technology. Moreover, advances driven by energy efficiency might also help to address textile mill effluent environmental issues.

The Textiles Sector Energy Task Force sponsored a "Spot the Energy Savings Opportunities" workshop that was customized for textiles companies and held in Montréal in spring 2002. The event was attended and enthusiastically received by nine companies and by representatives of the Indian Industrial Programme for Energy Conservation, who were on a study tour of CIPEC.

ACHIEVEMENTS

Based on NAICS* data for Groups 313 and 314, the textile industry improved its energy intensity by 34 percent between 1995 and 2001. The sector's actual energy use dropped by 38 percent during the same period, with a slight decrease in the industry's GDP. Although these numbers are encouraging, they appear to be overly optimistic based on the knowledge and experience of the sector. More work will be required in the coming year to better understand these aggregated and extrapolated data.

The Textiles Sector Energy Task Force remains committed to an energy intensity reduction target of 1 percent per year for the period 2000–2010. To meet this goal, the textile industry will build on its significant success in improving energy efficiency since 1995 and will continue its ongoing consultations with governments and other stakeholders to meet Canada's Kyoto goals.

CHALLENGES

Increased efforts are required to sensitize companies in the textile industry to the long-term implications of Canada's Kyoto commitments and to encourage active participation in Canada's National Implementation Strategy on Climate Change. The task force believes that one of its key challenges is to gain the active participation of more of the industry's major producers as Industrial Energy Innovators, and the group is continuing to work toward this end. In addition, companies must be encouraged to adopt a benchmarking and best-practices approach to energy management.

The Textiles Sector Energy Task Force and the Canadian Textiles Institute have devoted significant time and resources to addressing these challenges. These organizations plan to continue and intensify their efforts.

* Under the new North American Industry Classification System (NAICS), textile producers are classified under Artificial and Synthetic Fibres/Filaments Manufacturing (NAICS 32522), Textile Mills (NAICS 313) and Textiles Products Mills (NAICS 314). NAICS Subgroup 32522 includes producers of synthetic fibres and filaments. NAICS Group 313 comprises establishments that are primarily engaged in manufacturing, finishing or processing yarn or fabrics. NAICS Group 314 includes establishments primarily engaged in manufacturing textile products (except clothing) such as carpets, household textiles, etc. Changes to the classification of industries by Statistics Canada from the Standard Industrial Classification (SIC) to NAICS means that energy data for the synthetic fibre industry are no longer available separately. The statistics contained in this profile cover only NAICS Groups 313 and 314 as described above.

Transportation Equipment Manufacturing

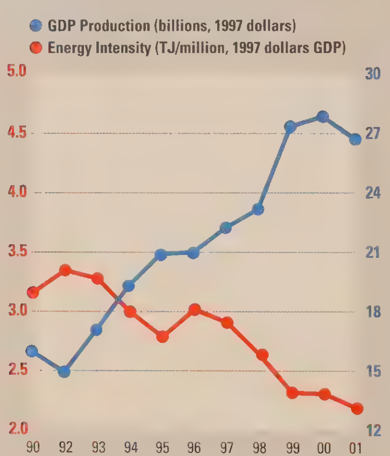
Profile *The Canadian transportation equipment manufacturing sector includes companies that manufacture aircraft, aircraft parts, automobiles, motor vehicle parts, trucks, buses, trailers, military vehicles, railroad rolling stock, ships and pleasure boats. The sector is a major part of the Canadian economy, accounting for nearly 3 percent of Canada's GDP and more than 16 percent of Canada's total manufacturing GDP in 2001. Including dealers, parts and distribution networks, the sector employs more than a half a million people across Canada.*

Performance Highlights

- Despite an upturn in the Canadian economy at the end of 2001, the value of the total output of the transportation manufacturing sector for the year still decreased by 4.2 percent.
- Between 1990 and 2001, the sector recorded an overall improvement in energy intensity of 30.9 percent.
- Honda of Canada Mfg., Toyota Motor Manufacturing Canada Inc. and The Woodbridge Group joined the Transportation Sector Equipment Manufacturing Task Force in 2001, bringing additional automotive industry representation to the table.
- General Motors of Canada Limited reduced its total energy consumption by 41 percent from 1990 to 2001 through rationalization of production and energy conservation projects.
- The Woodbridge Group introduced an energy-reduction management system in 2002, resulting in the identification of potential energy savings.
- In 2001, Honda reduced the electricity requirements of a compressed-air system that resulted in a CO_2e emissions reduction of approximately 56 tonnes per year.
- Ford Motor Company of Canada, Limited implemented a heat recovery system at its casting plant in Windsor, Ontario, resulting in a potential energy reduction of 225 000 mmBTU per year.

Transportation Equipment Manufacturing Sector – NAICS 336000

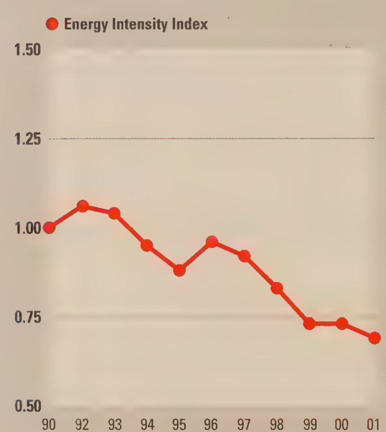
Energy Intensity and Economic Output (1990–2001)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–2001.* December 20, 2002. Simon Fraser University.

Transportation Equipment Manufacturing Sector – NAICS 336000

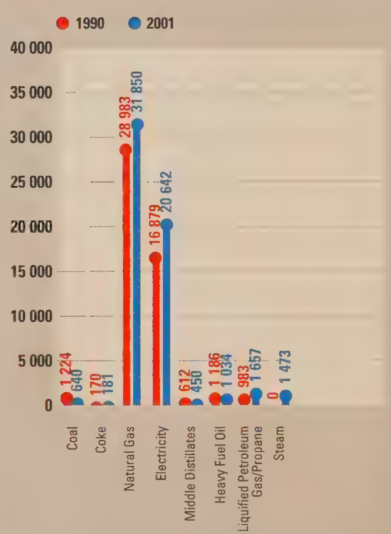
Energy Intensity Index (1990–2001) Base Year 1990 = 1.00



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–2001.* December 20, 2002. Simon Fraser University.

Transportation Equipment Manufacturing Sector – NAICS 336000

Energy Sources in Terajoules per Year (TJ/yr.)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–2001.* December 20, 2002. Simon Fraser University.

ACTIONS

The CIPEC Transportation Equipment Manufacturing Sector Task Force continues to pursue the activities outlined in its 2001–2003 action plan. Individual sector members have made significant advances in energy efficiency.

In 2002, The Woodbridge Group introduced an energy-reduction management system and delivered a customized "Dollars to $ense" energy training program across 57 locations worldwide. Eight training sessions alone enabled the company to identify $600,000 in energy savings opportunities. The Woodbridge Group has established a company-wide energy-reduction goal of 10 percent for 2003.

In 2001, Honda of Canada Mfg. reduced the electricity requirements of the compressed-air system in its Civic manufacturing plant by supplementing 1000-hp compressors with smaller, 500-hp units. Honda estimates that this project has led to a reduction in CO_2e emissions of approximately 56 tonnes per year. Honda has also taken steps to eliminate leaks in its compressed-air system and to reduce compressed-air demand by switching some assembly tools to electric power.

Ford Motor Company of Canada, Limited continues to seek opportunities to improve the energy efficiency of its manufacturing facilities. The company has installed a heat recovery system on the cupola melting process at its casting plant in Windsor, Ontario, enabling the plant to recover waste energy and redistribute it to areas of the plant where it is needed. The company expects this project to reduce energy usage by 225 000 mmBTU per year.

Toyota Motor Manufacturing Canada Inc. saw total energy-reduction results in excess of 168 665 mmBTU per year. Although capital input was minimal, most reductions resulted from delaying booth and oven starts, changing downdrafts in paint-shop ovens and booths, reducing plant temperature set-points and eliminating processes where quality improvement activities had made them redundant.

The Transportation Equipment Manufacturing Sector Task Force continued its tradition of promoting energy efficiency at its sixth annual One Day Energy Conference, held at General Motors of Canada Limited Headquarters in Oshawa, Ontario. Another annual energy conference is scheduled for the first quarter of 2003.

ACHIEVEMENTS

Despite a dramatic year-end economic upturn (assisted in large part by a no-interest purchase financing program in the automotive sector), the value of the total output of the transportation equipment manufacturing sector for 2001 still decreased by 4.2 percent. Energy usage for the year decreased by 9.0 percent over 2000, more than double the decrease in output. Consequently, the sector's energy intensity decreased by 5.2 percent. In 2001, the sector consumed 57 930 TJ, up 15.8 percent from 1990. Over the same period, gross output increased by 93.2 percent, leading to an overall improvement in energy intensity of 30.9 percent.

Energy use by fuel type has remained fairly constant since 1990, with natural gas (55 percent) and electricity (36 percent) making up the bulk of the energy used. Liquid petroleum gases, middle distillates (No. 2 fuel oil) and heavy fuel oil use increased by 12 percent in 2001 compared with 2000, due largely to the rapid escalation of natural gas prices. The use of these fuels, which was previously in a long period of decline, will undoubtedly continue to increase until natural gas prices return to historical levels.

CHALLENGES

The predicted downturn in the United States' economy, especially in the automotive sector, will have a detrimental effect on the transportation equipment manufacturing sector's energy intensity. Economically motivated plant downtime will lead to the under-utilization of facilities, thereby raising energy intensity numbers despite an overall decrease in energy consumption. Although the transportation equipment manufacturing sector is committed to continuously improving quality, environmental performance and energy efficiency, investment-payback requirements of less than two years and internal competition for funds are challenging energy managers who are seeking to make major gains. Moreover, energy efficiency improvements arising from the implementation of new technology are likely to be offset by trends that are driving energy use higher. These trends include the increased use of cooling to improve working conditions, more demanding pollution control and a shift to more energy intensive products and processes.

Sector companies are already efficient energy users, and there are relatively few cost-effective opportunities for dramatic gains, even under the pressure of higher energy costs. Unless there are major advances in technology, energy efficiency improvements are likely to come in small increments.

Upstream Oil and Gas

Profile *The upstream oil and gas sector includes the companies that find and develop Canada's vast hydrocarbon reserves. This dynamic exploration and production industry is represented by the Canadian Association of Petroleum Producers (CAPP) and the Small Explorers and Producers Association of Canada (SEPAC). The member companies of these associations account for more than 99 percent of the crude oil and natural gas produced in Canada and are an important part of a $60 billion-a-year national industry that affects the livelihoods of more than half a million Canadians.*

Performance Highlights

- Increasing numbers of upstream oil and natural gas companies are voluntarily embracing the industry's principles of stewardship. As of January 2003, all producing members of CAPP must commit to its Stewardship initiative.
- Between 1996 and 2001, the industry reduced gas flaring in Alberta by 53 percent.
- A credit of 2500 tonnes of CO_2 has been granted to Calpine Canada Resources Company for recovering and recycling oil from oil-field waste.
- GHG-reduction projects implemented in 2001 and 2002 have enabled ConocoPhillips Canada to reduce emissions by approximately 223 kilotonnes of CO_2e emissions per year.
- Petro-Canada uses an environmentally sensitive drilling rig in the Mackenzie Delta that saves fuel and reduces emissions of NO_x and CO_2.

The sector is currently working with NRCan's Office of Energy Efficiency to develop indices and figures.

ACTIONS

The upstream oil and gas sector is a strong proponent of environmental performance and energy conservation. Guides to best industry practices, thoughtful input into proposed legislative changes, and sponsorship of research and development that enhances industry's efficiency and reduces its effects are just a few of the ways that CAPP and SEPAC promote energy efficiency and environmental protection across the country. The industry has come a long way during the past decade and is committed to continued and further progress.

In 1999 CAPP established its Stewardship initiative, a voluntary program to encourage members to continually improve their environmental, health and safety performance and to report their progress to stakeholders. The Stewardship initiative provides quantitative benchmarks that allow firms to gauge areas of excellence and identify operations that need improvement. As of January 2003, all of CAPP's producing member companies must commit to the Stewardship initiative.

CAPP and SEPAC are developing a guide to help companies with calculations and methodologies for company-operated facilities on a gross-production basis and to empower facility operators to implement efficiency programs. The CAPP-SEPAC guide will also eliminate double-counting of emissions. CAPP member companies have agreed to use production energy intensity (PEI) and production carbon intensity (PCI) as standardized GHG performance indicators.

Following are examples of individual petroleum producers that have made significant strides toward improved energy efficiency and reduced GHG emissions.

Even while recording strong growth and increased production, EnCana Corporation has made significant progress in reducing absolute GHG emissions and emissions intensity. EnCana's absolute GHG emissions for 2001 were more than 2 megatonnes lower than its emissions in 2000.

From 2000 to 2001, Calpine Canada Resources Company actively worked to identify and implement actions to improve its energy efficiency, heat recovery and capture of vented or flared gas. Calpine's overall gross production volumes increased 10 percent over that period, while corresponding CO_2e emissions remained constant. In a joint project recognized by CleanAir Canada Inc. for creating emissions credits, Newalta Corporation granted Calpine a credit of 2500 tonnes of CO_2 for recovering and recycling oil from oil-field waste.

GHG-reduction projects implemented in 2001 and 2002 have enabled ConocoPhillips Canada to reduce emissions by approximately 223 kilotonnes of CO_2e emissions per year. Further actions planned for 2003 and 2004 will lower annual GHG emissions by an additional 56 kilotonnes of CO_2e, an 8.6 percent reduction compared with 2001.

Petro-Canada uses an environmentally sensitive drilling rig to explore for natural gas in the Mackenzie Delta. The rig is designed to redistribute all of the waste heat it generates while operating, saving fuel and reducing emissions of NO_x and CO_2.

ACHIEVEMENTS

As noted, as of January 1, 2003, all CAPP producer members must commit to the Association's Stewardship initiative. CAPP is developing practical tools that include presentations, workshops and implementation manuals to help its member companies meet their commitments.

In 1997 the Alberta Energy and Utilities Board and the Clean Air Strategic Alliance, along with various stakeholders, began a review of gas flaring in Alberta. By voluntarily pursuing the project team's recommendations, the industry achieved a 53 percent reduction in flaring by the end of 2001 (as compared with 1996), surpassing the project's targets. The industry has now turned its attention to the related issue of venting.

The upstream oil and gas sector is committed to research and development. For example, eight of the world's largest energy companies are participating jointly in the international CO_2 Capture Project to reduce the overall cost of the capture, transport and storage of CO_2.

CHALLENGES

Rising energy demands and higher prices have led to a rapid increase in exploration and development. Greater activity in the field translates into more energy consumption, making a reduction in overall energy use within the sector unlikely in the short term. However, sector companies have made substantial progress in reducing their energy intensity and, consequently, their carbon intensity.

Upstream oil and gas operations emit GHGs through the combustion of natural gas, propane and diesel; the process venting and fugitive emissions of methane; and the process venting of CO_2. The industry is also concerned about indirect emissions related to its purchase of electricity generated by fossil-fuel combustion. The sector is addressing each of these challenges through research and innovation and by sharing its successes throughout the industry.

Wood Products

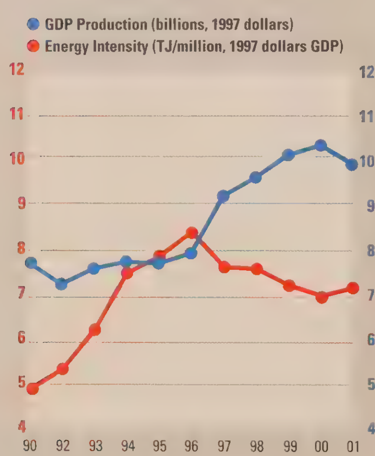
Profile *The wood products sector includes three industry groups: establishments engaged in sawing logs into lumber and similar products; companies that make products that improve the natural characteristics of wood by manufacturing veneers, plywood, reconstituted wood panel products and engineered wood assemblies; and establishments that make a diverse range of wood products, such as millwork. At the end of 2001, the industry consisted of nearly 3000 establishments across Canada that employed just under 20 000 workers.*

Performance Highlights

- Weldwood of Canada Limited's HI-ATHA sawmill does not generate any fossil-fuel GHG emissions during normal operations.
- Energy efficiency improvements at Riverside Forest Products Limited, Armstrong Division have resulted in an average GHG emissions reduction of 0.264 tonne of CO_2e per year per 1000 MSF (thousand square feet) of plywood produced.
- Tembec Industries Inc. has established its Impact Zero® program to minimize the effect of manufacturing activities on the environment.
- Erie Flooring and Wood Products has made significant improvements to its energy efficiency.
- Forintek Canada Corp.'s industry-wide energy benchmarking project is well underway.
- Wood products companies continue to develop cost-effective biomass energy systems to reduce the use of costly natural gas and electricity.

Wood Products Manufacturing Sector – NAICS 321000[1]

Energy Intensity and Economic Output (1990–2001)



Data source: Canadian Industrial Energy End-Use Data and Centre (CIEEDAC). *Development of Energy Intensity Indicators Analysis for Canadian Industry 1990–2001.* December 20, 2002. Simon Fraser University.

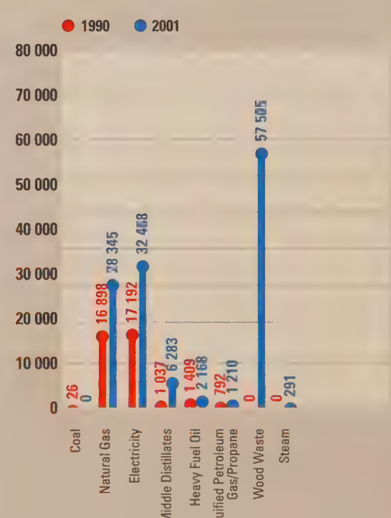
Wood Products Manufacturing Sector – NAICS 321000[1]

Energy Intensity Index (1990–2001) Base Year 1990 = 1.00

Data source: Canadian Industrial Energy End-Use Data and Centre (CIEEDAC). *Development of Energy Intensity Indicators Analysis for Canadian Industry 1990–2001.* December 20, 2002. Simon Fraser University.

Wood Products Manufacturing Sector – NAICS 321000

Energy Sources in Terajoules per Year (TJ/yr.)



Data source: Canadian Industrial Energy End-Use Data and Centre (CIEEDAC). *Development of Energy Intensity Indicators Analysis for Canadian Industry 1990–2001.* December 20, 2002. Simon Fraser University.

[1] Wood waste data not available prior to 1995. Wood waste is excluded from total.

ACTIONS

Forest product companies are actively building energy efficiency through improved operating methods and ongoing capital investment. For example, Weldwood of Canada Limited's HI-ATHA sawmill in Hinton, Alberta, does not generate any fossil-fuel GHG emissions during normal operations. Wood-waste fuel provides nearly all mill heating, including kiln drying. The mill's electricity is generated using biomass fuel at the adjacent Hinton pulp mill operation. The mill has reduced its propane consumption – used for winter heating – from an average of 225 000 litres to 50 000 litres by capturing surplus heat generated by wood waste from its lumber-drying kilns.

Between 1990 and 2000, Domtar Inc.'s GHG emissions from fossil fuels rose only 3.5 percent while production increased by 24.6 percent. This is a direct result of energy-reduction and continuous improvement activities throughout the company, better working practices that maximize the use of resources, improved efficiency, the elimination of waste and the replacement of fossil fuels by renewable biomass fuels.

Over the last three years, Riverside Forest Products Limited, Armstrong Division in Armstrong, British Columbia, has made improvements to its process furnaces, dryers and kilns and to systems for its motor drives, the boiler plant, water, lighting, heating, ventilation and air conditioning. The company has also advanced its use of cogenerated steam and electricity. These improvements have resulted in an annual average 0.61 percent reduction in GHG emissions, or 0.264 tonne of CO_2e per year per 1000 MSF (thousand square feet) of plywood produced. The company will continue to improve its operating, process and equipment efficiency and to reduce fossil-fuel consumption by drawing more energy from biomass sources.

Tembec Industries Inc. is committed to integrating sustainable development into its operations and to continually improving its environmental performance. To attain these objectives, Tembec has established the Impact Zero® program for its manufacturing facilities. The main goal of Impact Zero® is to minimize the effect of manufacturing activities on the environment. The program includes the development of environmental objectives, targets and action plans and the implementation and maintenance of an environmental management system in accordance with ISO 14001.

In its first year since becoming a CIPEC Industrial Energy Innovator, Erie Flooring and Wood Products of West Lorne, Ontario, has made significant improvements to its energy efficiency. By improving its boiler plant and systems for process heating, motor drives and lighting and climate control, the company has reduced its energy consumption by 10 percent per year. The company plans to continue to upgrade its older equipment with alternatives that are more energy efficient, install additional variable frequency motors and evaluate the potential for cogeneration.

Forintek Canada Corp.'s energy benchmarking project is well underway. The project, which has received funding from NRCan's Office of Energy Efficiency, is designed to support the CIPEC Wood Products Sector Task Force's efforts to promote energy efficiency in the solid wood industry. Forintek is examining industry performance in Canada and is developing benchmarking data to establish energy efficiency targets, action plans, policies and best practices within the sector's companies. To help refine its energy auditing procedures, Forintek has performed pre-audits on two mills and will begin auditing other facilities when company questionnaires are received. Forintek is also collecting general statistics on energy consumption in Canada and competing countries and is developing recommendations about the technologies in use in Canadian mills.

ACHIEVEMENTS

The wood products sector consumed 70 769 TJ of fossil fuels and electricity in 2001. Although rising production in the sector has driven energy consumption upward, actions taken by companies to improve energy efficiency have led to substantial gains in energy intensity.

Recent rises in energy prices will provide a powerful incentive for wood products manufacturers to implement low-cost energy efficiency measures. Companies will likely continue to develop cost-effective biomass energy systems based on wood waste, displacing the use of costly natural gas and electricity.

CHALLENGES

Companies in the wood products sector have continued to make investments and introduce measures that improve energy efficiency. However, ongoing adverse economic factors continue to make it exceedingly difficult for most forest products companies to invest in energy efficiency. Economic realities are also forcing companies to pursue new markets and to manufacture higher-value products that require more energy to produce.

Seeking to maintain production efficiency at sustainable levels, Canadian wood products companies have closed facilities and allocated production to fewer mills. Although the closure of facilities will reduce the sector's total energy consumption over the short term, the lack of investment in energy efficiency makes it unlikely that the industry will be able to make significant improvements in energy intensity.

Industrial Energy Innovators

Through NRCan's Office of Energy Efficiency (OEE), the Industrial Energy Innovators program focuses on transforming the sector-level commitments made by task forces into company-level action by helping to overcome obstacles to energy efficiency at the company level.

As of April 1, 2003, 374 manufacturing and mining companies – representing approximately 85 percent of industrial energy use in Canada – have signed on as Industrial Energy Innovators. The majority of these companies are participants in Canada's Climate Change Voluntary Challenge and Registry Inc. (VCR Inc.), a non-profit partnership between industry and government across Canada. VCR Inc. provides the means for promoting, assessing and recognizing the effectiveness of the voluntary approach in addressing climate change. In addition, 65 Industrial Energy Innovators and five trade associations have earned VCR Inc.'s Gold, Silver or Bronze Level Champion Reporter status.

CIPEC has strengthened the participation of Industrial Energy Innovators in VCR Inc. through a number of activities. These include programs to increase awareness of the economic benefits of improved energy use, tools to remove barriers that hinder energy management improvement projects within companies, and ideas to promote effective energy management systems within individual companies. CIPEC believes that parallel efforts among like-minded organizations are needed to maximize Canada's industrial energy efficiency.

For information on becoming an Industrial Energy Innovator, contact the OEE by e-mail at cipec.peeic@nrcan.gc.ca or visit the Web site at oee.nrcan.gc.ca/cipec.

Industrial Energy Innovators by Sector

Aluminum
Alcan Inc.
Alcoa – Aluminerie de Baie Comeau
Alcoa – Aluminerie de Bécancour Inc.
Alcoa – Aluminerie Lauralco, Inc.
Aluminerie Alouette Inc.

Brewery
Big Rock Brewery Ltd.
Labatt Breweries of Canada
Molson Breweries – Edmonton Brewery
Molson Canada – Ontario
Moosehead Breweries Ltd.
Sleeman Brewing and Malting Co. Ltd.

Cement
ESSROC Canada Inc.
Gordon Shaw Concrete Products Ltd.
Lafarge Canada Inc.
Lehigh Inland Cement Limited
St. Lawrence Cement Inc.
Tilbury Cement Ltd.

Chemical
Chinook Group Limited – Sombra Plant
Degussa-Hüls Canada Inc.
DuPont Canada Inc.
MDS Nordion Inc.
Nacan Products Limited
NOVA Chemicals Corporation
OxyVinyls Canada Inc.
Rohm and Haas Canada Inc.

Construction
Lockerbie & Hole Industrial Inc.

Dairy
Agrinor Inc.
Agropur
Armstrong Cheese Company Ltd. – Alberta
Foothills Creamery Ltd.
Hewitt's Dairy Limited
Laiterie Chagnon Ltée
Lone Pine Cheese Ltd.
Le Mouton Blanc
Parmalat Dairy & Bakery Inc.
Pine River Cheese & Butter Co-operative
Roman Cheese Products Ltd.
Salerno Dairy Products Ltd.

Electrical/Electronics
ASCOlectric Ltd.
Broan-NuTone Canada
Camco Inc.
Century Circuits Inc.
Crest Circuit Inc.
Honeywell Limited
IBM Canada Ltd.
Milplex Circuit (Canada) Inc.
Nortel (Northern Telecom Limited)
Osram Sylvania Ltd.
PC World – Division of Circuit World Corporation
Vansco Electronics Ltd.

Electricity Generation
Ontario Power Generation Inc.

Fertilizer
IMC Potash Belle Plaine
IMC Potash Colonsay
IMC Potash Esterhazy
Potash Corp. of Saskatchewan Inc.
– Allan Division
– Cory Division
– Lanigan Division
– New Brunswick Division
– Patience Lake Division
– Rocanville Division

Food and Beverage
Alberta Processing Co., A Division of West Coast Reduction Ltd.
Andrés Wines Ltd.
API Grain Processors
Beta Brands Limited
Better Beef Ltd.
Black Velvet Distilling Co.
Borden Foods Canada
Burnbrae Farms Ltd. – Mississauga
Canada West Foods J.V. Inc.
Canamera Foods
Canbra Foods Ltd.
Canyon Creek Soup Company Ltd.
Cargill Animal Nutrition – Camrose Plant
Cargill Animal Nutrition – Lethbridge Plant
Cargill Foods – High River Plant
Carson Foods
Casco Inc.
Champion Petfoods
Coca-Cola Bottling Ltd.
Cuddy Food Products
Don Chapman Farms Ltd./ Lakeview Vegetables Inc.
Effem Inc.
Family Muffins & Desserts Inc.
Furlani's Food Corporation
Garden Province Meats Inc.
Greenview Aquafarm Ltd.
H.J. Heinz Company of Canada Ltd.
Heritage Frozen Foods Ltd.
Hershey Canada Inc.
Hubberts Industries
Hub Meat Packers Ltd. – Sunrise Brand
J.R. Ouimet Inc.
Kraft Canada Inc.
Legal Alfalfa Products Ltd.
Lilydale Cooperative Ltd.
Maple Leaf Foods Inc.
Maple Lodge Farms Ltd.
Marsan Foods Limited
McCain Foods (Canada) – Alberta, A Division of McCain Foods Limited
Mitchell's Gourmet Foods Inc.
Nestlé Canada Inc.
Northern Alberta Processing Co., A Division of West Coast Reduction Ltd.
Oakrun Farm Bakery Ltd.
Les Oeufs Bec-O Inc.
Olymel, L.P.
Pepsi-Cola Canada Beverages
Prairie Mushrooms (1992) Ltd.
Principality Foods Ltd.
Reinhart Foods Limited
Quality Fast Foods
Sakai Spice (Canada) Corporation
Schneider Foods
Sunny Crunch Foods Limited
Sunrise Bakery Ltd.
Sun-Rype Products Ltd.
Sun Valley Foods Canada
Townline Foods/Processing Ltd.
Transfeeder Inc.
Trochu Meat Processors
Trophy Foods Inc.
Unifeed Premix
Versacold Corporation
Westcan Malting Ltd.
Westglen Milling Ltd.
Weston Foods Inc.

Foundry
Ancast Industries Ltd.
Bibby-Ste-Croix
Century Pacific Foundry Ltd.
Crowe Foundry Limited
Deloro Stellite Inc.
ESCO Limited – Port Coquitlam Operations
ESCO Limited – Port Hope Operations
Eureka Foundry Corporation (A Subsidiary of ACI Canada Inc.)
Gamma Foundries Limited
Grenville Castings Limited
Ramsden Industries Limited
Stackpole Limited
Vehcom Manufacturing (A Division of Comtech Mfg. Ltd.)
Wabi Iron & Steel Corporation

Industrial Energy Innovators by Sector

General Manufacturing

3M Canada Inc.
ABCO Property Management Inc.
Acadian Platers Co. Ltd.
Armstrong World Industries Canada Ltd.
Bentofix Technologies Inc.
Canadian Uniform Limited
Champion Feed Services Ltd.
Climatizer Insulation Inc.
Corus s.e.c.
Coyle & Greer Awards Canada Ltd.
Crown Cork & Seal Canada Inc.
Descor Industries Inc.
Dipaolo CNC Retrofit Ltd.
Emco Limited – Building Products
Envirogard Products Ltd.
Escalator Handrail Company Inc.
Euclid-Hitachi Heavy Equipment Ltd.
Federated Co-operatives Limited
Ferraz Shawmut Canada Inc.
Fibrex Insulations, Inc.
Garland Commercial Ranges Limited
Greif Containers Inc.
IKO Industries Ltd.
Imaflex Inc.
Imperial Home Decor Group Canada Inc.
Imperial Tobacco Canada Limited
Interface Flooring Systems (Canada) Ltd.
International Paper Industries Ltd.
J.A. Wilson Display Ltd.
Jones Packaging Inc.
Kindred Industries
Kodak Canada Inc.
LePage (Division of Henkel Canada Limited)
Maksteel Service Centre (Division of Makagon Industries Ltd.)
Metro Label Company Ltd.
Metroland Printing, Publishing & Distributing Ltd.
Montupet Ltd.
North American Decal
Norwest Precision Limited
Orica Canada Inc.
Owens Corning Canada Inc. – Candiac Plant
Owens Corning Canada Inc. – Toronto Plant
Polytainers Inc.
PowerComm Inc.
Procter & Gamble Inc.
PRO-ECO Limited
Russel Metals Inc. (Alberta)
S.C. Johnson and Son, Limited
Saint-Gobain Ceramic Materials
Sandvik Tamrock Canada Inc.
Sandvik Tamrock Loaders Inc.
Scapa Tapes North America
Simmons Canada Inc.
Soprema Inc. (Drummondville Plant)
Stowe Woodward Co. (British Columbia) (Division of Cascades Inc.)
Superior Radiant Products Ltd.
Teknion Furniture Systems Inc.
Unifiller Systems, Inc.
VA TECH Ferranti-Packard Transformers Ltd.
VicWest Steel
Wabash Alloys Ontario
Waiward Steel Fabricators Ltd.
Wyeth-Ayerst Canada Inc.
ZENON Environmental Inc.

Lime

Carmeuse Lime (Beachville) Limited
Chemical Lime Company of Canada Inc.
Dundas Lime Limited
Graymont (NB) Inc.
Graymont (QC) Inc.
Graymont Western Canada Inc.
Northern Lime Limited

Mining

Aur Resources Inc.
Barrick Gold Corporation
BHP Billiton Diamonds Inc.
Boliden Limited
Canadian Electrolytic Zinc Limited
Echo Bay Mines Ltd. – Lupin Operation
Falconbridge Limited
Fonderie Horne – Métallurgie Noranda inc.
Hillsborough Resources Limited
Hudson Bay Mining & Smelting Co., Ltd.
Inco Limited
Iron Ore Company of Canada
Mines et exploration Noranda inc. – Division Matagami
Mines Wabush (Managed by Compagnie Minière Cliffs inc.)
Newmont Canada Limited, Golden Giant Mine
Noranda Inc. – Brunswick Mining Division
Noranda Inc. – Brunswick Smelter
Noranda Metallurgy Inc. (Canadian Copper Refinery)
Placer Dome Canada Limited
Quebec Cartier Mining Company
Syncrude Canada Ltd.
Teck Cominco Limited

Petroleum Products

Bitumar Inc.
Canadian Tire Petroleum
Chevron Canada Limited – Burnaby Refinery
Husky Energy Inc.
Imperial Oil Limited
Irving Oil Limited
Parkland Refining Ltd.
Pengrowth Corporation
Petro-Canada
Safety-Kleen Corp.
Shell Canada Products Limited
Suncor Energy Inc. – Sunoco Group
Ultramar Ltd. (Saint-Romuald Refinery)

Plastics

The Clorox Company of Canada, Ltd.
Downeast Plastics Ltd.
Husky Injection Molding Systems Ltd.
Matrix Packaging Inc.
Par-Pak Ltd.
Silgan Plastics Canada Inc.

Pulp and Paper

Abitibi-Consolidated Inc.
Bowater Canadian Forest Products Inc.
Cariboo Pulp and Paper Company Limited
Cascades Inc.
Domtar Inc.
Emballages Smurfit-Stone Canada inc. – La Tuque Plant
Eurocan Pulp & Paper Company Limited
F.F. Soucy Inc.
Interlake Paper Limited
Kruger Inc.
Lake Utopia Paper
Marathon Pulp Inc.
Maritime Paper Products Limited
New Skeena Forest Products Inc.
Norampac Inc. (Division of Cascades Inc.)
NorskeCanada
Paperboard Industries International Inc. (Division of Cascades Inc.)
Papiers Stadacona
Perkins Papers Inc. (Division of Cascades Inc.)
Rolland Inc. (Division of Cascades Inc.)
St. Marys Paper Ltd.
Stora Enso North America, Port Hawkesbury Mill
Tembec Paper Group – Spruce Falls Operations
Tolko Manitoba Kraft Papers
UPM-Kymmene Miramichi, Inc.
Weldwood of Canada Limited
West Fraser Timber Co. Ltd.

Rubber

Goodyear Canada Inc.
Hamilton Kent
Michelin North America (Canada) Inc.
NRI Industries Inc.

Steel

Algoma Steel Inc.
AltaSteel Ltd.
Atlas Specialty Steels
(A Division of Slater Stainless Corp.)
CHT Steel Company Inc.
Dofasco Inc.
Gerdau Ameristeel Corporation
Hilton Works (A Division of Stelco Inc.)
Ivaco Inc. (Ivaco Rolling Mills)
Lake Erie Steel Company
(A Division of Stelco Inc.)
Laurel Steel (Division of Harris Steel Limited)
Namasco Limited
QIT – Fer et Titane inc.
Slater Steel Inc. – Hamilton Specialty Bar Division
Stelco Inc.
Stelco-McMaster Ltée
Stelfil Ltée
Stelpipe Ltd.
Stelwire Ltd.

Textiles

Agmont Inc.
Albarrie Canada Limited
Barrday Inc.
Beaulieu Canada Company
Bennett Fleet (Quebec) Inc.
Britex Group (The)
C.S. Brooks Canada Inc. (Magog)
Cambridge Towel Corporation (The)
Cavalier Textiles
Coats Bell
Collingwood Fabrics Inc.
Collins & Aikman Canada Inc.
Consoltex Inc.
CookshireTex inc.
Denim Swift
Doubletex Inc.
Fabrene Inc.
J.L. de Ball Canada Inc.
LaGran Canada Inc.
Lincoln Fabrics Ltd.
Manoir Inc.
Monterey Textiles (1996) Inc.
Nova Scotia Textiles, Limited
PGI-DIFCO Performance Fabrics Inc.
Spinrite Inc.
St. Lawrence Corporation
Stedfast Inc.
Velcro Canada Inc.
VOA Colfab Inc.

Transportation Equipment Manufacturing

ABC Group Inc.
Accuride Canada Inc.
Air Canada Technical Services
Boeing Toronto Limited
Bombardier Aerospace
Bombardier Inc. – Valcourt Plant
Cami Automotive Inc.
Canadian General-Tower Limited
Canadian Pacific Railway Company
DaimlerChrysler Canada Inc.
Dresden Industrial, A Division of
KSR International Co.
Dura Automotive Systems (Canada), Ltd.
Dynaplas Ltd.
Ford Motor Company of Canada, Limited
General Motors of Canada Limited
Honda of Canada Mfg.
Iafrate Machine Works Ltd.
International Truck and Engine
Corporation Canada
Oetiker Limited
Orenda Aerospace Corporation
Orion Bus Industries Inc.
Oxford Automotive, Inc. –
Suspension Division, Chatham
Polywheels Manufacturing Ltd.
Pratt & Whitney Canada Inc.
Presstran Industries
Prévost Car Inc.
Production Paint Stripping Ltd.
R. Reininger & Son Limited
Rockwell Automation Canada Inc.
Russel Metals Inc.
Sterling Trucks, A Division of Freightliner Limited
Toyota Motor Manufacturing Canada Inc.
TRW Automotive
Volvo Cars of Canada Ltd.
Woodbridge Group (The)

Upstream Oil and Gas

BP Canada Energy Company
ConocoPhillips Canada (North) Limited –
Empress Plant
Enbridge Pipelines Inc.
Newalta Corporation
Nexen Canada Ltd.
Paramount Resources Ltd.
Taurus Exploration Ltd.
Trans World Oil & Gas Ltd.

Wood Products

Canfor Corporation
Erie Flooring and Wood Products
Madawaska Doors Inc.
Marcel Lauzon Inc.
Nexfor Inc.
Riverside Forest Products Limited,
Armstrong Division
Tembec Industries Inc.
Weyerhaeuser Canada Ltd.

Association Members

Aerospace Industries Association of Canada

Alberta Food Processors Association

Aluminium Association of Canada

Automotive Parts Manufacturers' Association

Baking Association of Canada

Canadian Association of Manmade Vitreous Fibre Manufacturers

Canadian Association of Petroleum Producers

Canadian Chamber of Commerce

Canadian Chemical Producers' Association

Canadian Construction Association

Canadian Council of Grocery Distributors

Canadian Electricity Association

Canadian Fertilizer Institute

Canadian Foundry Association

Canadian Gas Association

Canadian Lime Institute

Canadian Manufacturers & Exporters (CME)

– CME Alberta Division

– CME British Columbia Division

– CME Manitoba Division

– CME New Brunswick Division

– CME Newfoundland Division

– CME Nova Scotia Division

– CME Ontario Division

– CME Prince Edward Island Division

Canadian Meat Council

Canadian Petroleum Products Institute

Canadian Plastics Industry Association

Canadian Steel Environmental Committee (Canadian Steel Producers Association)

Canadian Textiles Institute

Canadian Vehicle Manufacturers' Association

Cement Association of Canada

Council of Forest Industries

Electro-Federation Canada

Fisheries Council of Canada

Food and Consumer Products Manufacturers of Canada

Forest Products Association of Canada

Forintek Canada Corporation

Mining Association of Canada

Ontario Agri Business Association

Ontario Food Producers' Association

Packaging Association of Canada

Québec Forest Industries Association

Rubber Association of Canada

Small Explorers and Producers Association of Canada

Industrial Programs Division Staff

Tim Norris
Director
Tel.: (613) 996-6872
E-mail: tnorris@nrcan.gc.ca

Philip B. Jago
Assistant Director
Tel.: (613) 995-6839
E-mail: pjago@nrcan.gc.ca

Catriona Armstrong
Industry Officer
Tel.: (613) 992-3286
E-mail: carmstro@nrcan.gc.ca

Jean-Marc Berrouard
Industry Officer
Tel.: (613) 943-2224
E-mail: jberroua@nrcan.gc.ca

Marlene Blakney
Senior Industry Officer
Tel.: (613) 996-8278
E-mail: mblakney@nrcan.gc.ca

Beryl Broomfield
Program Assistant
Tel.: (613) 947-4828
E-mail: bbroomfi@nrcan.gc.ca

Mark Butkus
Writer/Editor
Tel.: (613) 943-0125
E-mail: mbutkus@nrcan.gc.ca

Monique Caouette
Program Manager, "Dollars to $ense" Workshops
Tel.: (613) 996-2494
E-mail: caouette@nrcan.gc.ca

Marguerite Dehler
Senior Industry Officer
Tel.: (613) 992-1545
E-mail: madehler@nrcan.gc.ca

Hydie Del Castillo
Program Assistant, "Dollars to $ense" Workshops
Tel.: (613) 947-2047
E-mail: hdelcast@nrcan.gc.ca

Suzanne Forget-Lauzon
Publications and Database
Tel.: (613) 992-3254
E-mail: sforgetl@nrcan.gc.ca

Eric Gingras
Industry Officer
Tel.: (613) 943-5326
E-mail: egingras@nrcan.gc.ca

Sonia Ieria
Industry Officer
Tel.: (613) 944-4506
E-mail: sieria@nrcan.gc.ca

Patricia Lieu
Industry Officer
Tel.: (613) 995-3737
E-mail: plieu@nrcan.gc.ca

Vaughn Munroe
Senior Technical Services Advisor
Tel.: (613) 947-1594
E-mail: vmunroe@nrcan.gc.ca

Kari-Lynn Philipp
Industry Officer
Tel.: (613) 943-2361
E-mail: kphilipp@nrcan.gc.ca

Melanie Phillips
Senior Industry Officer
Tel.: (613) 995-3504
E-mail: mphillip@nrcan.gc.ca

Andrew Powers
Program Assistant
Tel.: (613) 996-5125
E-mail: apowers@nrcan.gc.ca

Keith Quach
Senior Industry Officer
Tel.: (613) 992-3288
E-mail: kquach@nrcan.gc.ca

Johanne Renaud
Program Officer, "Dollars to $ense" Workshops
Tel.: (613) 996-6585
E-mail: jrenaud@nrcan.gc.ca

Glenda Taylor
Senior Industry Officer
Tel.: (613) 992-3422
E-mail: gtaylor@nrcan.gc.ca

Miranda Williamson
Industry Officer
Tel.: (613) 996-7744
E-mail: miwillia@nrcan.gc.ca

Glossary of Terms

Annual Census of Mines
NRCan survey that collects information on NAICS 2122 (Metal Mining) and NAICS 2123 (Non-Metal Mineral Mining and Quarrying). Full name is Annual Census of Mines, Quarries and Sand Pits.

Annual Survey of Manufacturers (ASM)
Statistics Canada survey. Provides information on the consumption of purchased fuels and electricity (CPFE) for approximately 230 sub-sectors at four-digit NAICS code levels.

Base Year
A reference year. For the Framework Convention on Climate Change, 1990 is the base year.

Canada's Climate Change Voluntary Challenge and Registry Inc. (VCR Inc.)
VCR Inc. is a key element of Canada's National Action Program on Climate Change. It encourages the private and public sectors to take voluntary steps to limit or reduce GHG emissions. As a first step, participants are encouraged to submit a letter of intent confirming a commitment to limit or reduce GHGs from their operations. This is followed by an action plan and subsequent progress reports. The Industrial Programs Division of NRCan's Office of Energy Efficiency provides a means for manufacturing, mining, construction and energy supply companies to enrol in VCR Inc.

Carbon Dioxide (CO_2)
A compound of carbon and oxygen that in its normal gaseous state is clear and colourless. CO_2 is formed whenever carbon-bearing fuels are burned. It can also be formed via other reactions that do not involve combustion.

Carbon Dioxide Equivalent (CO_2e)
A metric measure used to compare the emissions of the different GHGs based upon their global warming potential. Global warming potentials are used to convert GHGs to CO_2e.

Economic Energy Intensity
Energy consumption per unit of economic output.

Embodied Energy
The energy consumed to transform all upstream raw materials into the final product; in a life-cycle approach, it would be the "cradle to grave" energy burden.

Energy Intensity
Energy consumption per unit of output.

Energy Intensity Indicator
A dimensionless ratio equal to the energy intensity in a particular year divided by the energy intensity of the base year. The energy intensity indicator for the base year equals 1.0.

Energy Performance Measures
Any of a variety of metrics that would indicate an aspect of energy performance.

Framework Convention on Climate Change
United Nations convention to address climate change signed by more than 150 countries at the United Nations Conference on Environment and Development in Rio de Janeiro in June 1992. Canada became the eighth country to ratify the Convention, which entered into force on March 21, 1994, thereby committing to work toward stabilizing GHG emissions at 1990 levels by the year 2000.

Greenhouse Gas (GHG)
A GHG absorbs and radiates heat in the lower atmosphere that otherwise would be lost in space. The greenhouse effect is essential for life on this planet since it keeps average global temperatures high enough to support plant and animal growth. The main GHGs are carbon dioxide (CO_2), methane (CH_4), chlorofluorocarbons (CFCs) and nitrous oxides (N_2O). By far the most abundant GHG is CO_2, accounting for 70 percent of the greenhouse effect.

Gross Domestic Product (GDP)
The total value of goods and services produced by the nation's economy before deduction of depreciation charges and other allowances for capital consumption, labour and property located in Canada. It includes the total output of goods and services by private consumers and government, gross private domestic capital investment and net foreign trade. GDP figures are reported in real 1997 dollars unless otherwise noted.

Higher Heating Value
The amount of heat that is obtained when a specified amount of fuel is combusted with its stoichiometrically correct amount of air, both being at 15°C when combustion starts, and the products of combustion being cooled to 15°C before the heat release is measured (also called gross calorific value or gross heating value).

Industrial Consumption of Energy (ICE) Survey
Statistics Canada survey on energy use. Covers purchased and non-purchased energy for approximately 24 industrial sub-sectors.

Lower Heating Value
The higher heating value minus the latent heat of vaporization of the water vapour formed by the combustion of any hydrogen present in the fuel. For a fuel with no hydrogen, the higher and lower heating values are the same (also called the lower calorific value or the net heating value).

Natural Resources Canada (NRCan)
The predominant natural resource department of the Government of Canada, NRCan has a mandate to promote the sustainable development and responsible use of Canada's mineral, energy and forestry resources and to develop an understanding of Canada's land mass.

Nitrogen Dioxide (NO_2)
One of a group of gases called nitrogen oxides, which are composed of nitrogen and oxygen. Like sulphur dioxide, nitrogen oxides can react with other chemicals in the atmosphere in the presence of sunlight to form acidic pollutants, including nitric acid.

Nitrogen Oxides (NO_X)
The sum of nitric oxide (NO) and nitrogen dioxide (NO_2). Nitrogen oxides react with volatile organic compounds in the presence of sunlight to form ground-level ozone.

North American Industry Classification System (NAICS)
A classification system that categorizes establishments into groups with similar economic activities. The structure of NAICS, adopted by Statistics Canada in 1997 to replace the 1980 Standard Industrial Classification (SIC) system, has been developed by the statistical agencies of Canada, Mexico and the United States.

Physical Energy Intensity
Energy consumption per unit of physical output.

Quarterly Report on Energy Supply and Demand (QRESD)
Provides an energy balance of all energy consumption in Canada. QRESD data on the manufacturing industries are gathered principally by the Industrial Consumption of Energy (ICE) survey. These data are supplemented by other surveys on the disposition of energy (from utilities) and the production of petroleum products.

Specific Energy (Consumption)
Energy consumption per physical unit of output (also called physical energy intensity).

Standard Industrial Classification (SIC)
A classification system that categorizes establishments into groups with similar economic activities.

Statistics Canada
Statistics Canada is the country's national statistical agency, with programs organized into three broad subject areas: demographic and social, socio-economic and economic. Under the *Statistics Act*, Statistics Canada is required to collect, compile, analyse, abstract and publish statistical information on virtually every aspect of the nation's society and economy. All information given to Statistics Canada through surveys, the census or any other source is confidential. Statistics Canada does not release any information that identifies an individual or organization.

Sulphur Oxides (SO_X)
A product of combustion of fuels that contain sulphur. SO_X is a major component of acid rain.

Tier I
Informal designation by CIPEC of industries that are major energy-consuming industries. The seven designated Tier I industries are pulp and paper, petroleum refining, cement, mining, steel, chemicals and aluminum. The Tier I industries account for approximately 80 percent of total Canadian industrial energy consumption.

Tier II
Informal designation by CIPEC of industries that are minor energy-consuming industries (relative to Tier I industries) but contribute substantially to Canadian industrial GDP. Tier II industries account for 60 percent of Canadian industrial GDP.

For more information or to receive additional copies of this publication, write to:

Canadian Industry Program for Energy Conservation

c/o Natural Resources Canada
Office of Energy Efficiency
580 Booth Street, 18th Floor
Ottawa ON K1A 0E4

Tel.: (613) 995-6839
Fax: (613) 992-3161
E-mail: cipec.peeic@nrcan.gc.ca
Web site: oee.nrcan.gc.ca/cipec

Leading Canadians to Energy Efficiency at Home, at Work and on the Road

The Office of Energy Efficiency of Natural Resources Canada strengthens and expands Canada's commitment to energy efficiency in order to help address the challenges of climate change.

Canada